VIATION

CONTENTS FOR APRIL. 1945

Volume 44 . Number 4

12.	Briefing for April	9
223	Down the Years in Aviation's Log	5
100	America Wants Prosperity	103
The state of the s	Editorial: Surplus-The Industry's Sword of Damoeles	105
	Measuring That Feederline Market James G. Ray	106
	Florida Coordinates Action on Aviation Legislation	
	Howard W. Hartley	110
		112
	Tipe and Techniques for Alaska-Dound Flyers	
George W. Pfeil Leslie E. Neville	Marketina	
Publisher Editor	markeying	114
John Foster, Jr Managing Editor	New Horizons Opened for Aircraft Markets John Foster, Jr.	***
	and the second s	
	Aviation Research Design Production Design Progress On Junkers Hydraulic Propeller John D. Waugh	117
	Why More Than Two Engines?	124
		129
	Modifying Superbombers On the Production Line D. R. Abram	134
Chester S, Ricker Defroit Editor Wm. R, Nelson West Coast Editor	Aviation Laboratory Organizations, Prewar and Postwar	
Wm. R. Nelson Washington Editor	Aviation Laboratory Organizations, Flewar and Losswan K. R. Jackman	138
Dallas Mellard		142
Paul Wooton Chief of Washington Bureau		145
* * *	Is Airplane Stability Such a Mystery?, I	184
On leave of absence With Government Services	Aviation's Sketchbook of Design Detail	189
Cod Names Colonel Air Forces	Aviation's Engineering Data Book	194
Chales & McDaynolds Major, Air Forces	Review of Patents	
	New Products and Practices	223
Randolph Hawthorne Major, Air Forces	New Products and Fractices	
Kenneth D. Reynolds. Lieutenant, Infantry David Baker. Private, Air Forces	Aviation Maintenance	
Don FinkSpecial Assignment	Five Shop-Method Improvements by Navy Mechanics	149
* * * .		151
Andrew B. Martin, Sales Manager		
	Aviation's Maintenance Notebook	155
District Managers: Boston, Hunter Snead; New York, Robert F. Boger; Philedelphie, C. M.		
Edler and E. M. Schellenger; Claveland, A. H.	Air Transport	
Rartich and R. S. Cohb: Detroit, C. W. Evaul;	The Party To Marke Charles Course Constantly Edward E. Thorp	149
Chicago A. F. Meanor: St. Louis, W. E. Don-	How Engineering Can Simplify Cruise Control James B. Rea	161
nell; Los Angeles, E. W. Potter; Sen Francisco,	now Engineering Can Shapar) Grand States	
John Otterson.	SERVICE AND ADDRESS OF THE PARTY OF THE PART	
AND DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUM	"Level Off" Looms for Airline Profits Raymond L. Hoadley	v 166
	"Level Off" Looms for Airline Profits	,
CERAWAHILL PURLISHING CO., INC. Publication office 99-129		
Horadway, Albany, N. V. Better pestage assarchised. Editedial forth Breadway, Albany, N. V. Better pestage assarchised. Editedial for societies officers: Sale West (2nd Breadway), Ref. 18, M. V. Horadway, C. Chicago, CO Novell Michael Ave.; Ban Francisco, 65 hours like. Weakington: 18 Seath Bread St. Philadelphia; Hanna Weakington, Co. Sale St. Philadelphia (Bank), Philadelphia (Bank)	Civil Operatione John Abiuss Barn Becomes Hangar	. 160
banch offices: Chicago, 529 North Michigan Ave.: San Francisco, 68	Barn Becomes HangarJohn Abiuse	9 108
The Biret; Aldwych House, Aldwych, London, W.C. 2; Millones	Profite Ride In On Those Buses William H. Rodde	170

North Broadway, Albany, N. Y. Retern postage searchtood. Editoria
and executive offices: 330 West 42nd Street, New York, 18, M. Y.
Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 68
Post Street; Aldwych House, Aldwych, London, W.C. 2; National Press Bidg., Washington; 16 South Broad St., Philadelphia; Hanna
Big., Coveland; 1950 Penobsost Bidg., Detroit; Continental Bidg., St. Louis; 1627 Statler Bidg., Boston; Rhodes-Haverty Bidg.,
Aliana; Sil S. Hope, Los Angeles; 728-2 Oliver Bldg., Pittsburgh.
JAMES H. McGRAW, Founder and Honorary Chairman; JAMES
S. McGRAW, Jr., President; HOWARD EHRLICH, Executive Vice-
President for Business Operations; JOHN ABBINK, Executive Vice- President for Editorial Operations; CURTIS W. McGRAW, Ylee-
President and Treasurer; JOSEPH A. GERARDI, Secretary; J. E.
or two years, \$6.00 for three years, payable in Canadian currency at my. Great British and British Possessiens 30 shillings per year, 60
three years. Please indicate position and company connection on all
subscription orders. Entered as second-class matter September 3, 1936.
at the Post Office, Albany, New York, under the Act of March 3, 1879.
Volume 44, Number 4, Printed in U. S. A. Cable Address, "McGraw-
hill New York." Member A.B.C. Copyright 1945 by McGraw-Hill
Publishing Company, Inc., 330 West 4Ind Street, New York, N. Y. The contents of this Issue are copyrighted and may not be reproduced
without the permission of the copyright owner. The following publica-
tion is combined with AVIATION: AEBONAUTICAL ENGINEERING
to Periodical Literature and in Industrial Arts Index.
The same of the sa
The state of the s

Profits Ride In On Those Buses. William H. Rodda And Now-Waterprofed Dirt Runways. Aviation's Lubrication Charts.	171 172 179
Flying Equipment Postwar Feederliner Projected by Hughes Johanou Company Testa New Rocket 185. Douglas A.36 Proves "Hottset" Attack Bomber. Four New Models Atmounted by Skyatat.	173 174 175 176
Militery AAF Battlefront Engineers Fight to Build	198
Side Slipe	221
The Aviation News	
National Aviation 203 Transport Aviation 204 Aviation Manufacturing 208 Aviation Manufacturing 208 Aviation People	215
	3



Stromberg Injection Carburgtion "Raises the Roof" of fighter efficiency

A Strombers Injection Corbonston is stundend applement in excellent reason: The Stremberg Injection Carboretor automatically and instantly compensates for changes in altitude. resition, temperature and speed. The ene mixture is absore right for all flying conditions. And keeping our nilots on too is only one of its advantages. It has notably increased flight rause as well. This ability to get more miles from a given fuel load will naturally make these Bendix-built and designed carbonators vestly important to the cares planes of the fotune.

FOR TOP-FLIGHT PERFORMANCE The Streeting Injection Contents have observely increased the colling or will be swape of Spiting and banking plant in banking with the food reasonth finish.

country condition by they are and Since or best fired and return when sinwith boother with his promitted stellar again. and department since the auction above a Amount on out home. Particularly phone and is despitation operation aire and weight to the provided often be pro-ted in "Measuring Flast Facefulles Man-Cargo 1943. This thoughtful appended.

PE Vo Age (1929) -- Piring comments are commenced by Callot of combat planes. . . Eritish find biquel metal entirientry for engine values.

Navy offers charlete but sweet peoplates at \$2,000 to \$21,000. . . . Four SVA Italian land planes for Street to Tokyo mithest southern 15 Yr. Age (1930) -- Perkurd brines out Diesel singraft engine. . . . Dutrost cooms \$5,000 000 etty surport Designa reports assets of \$3.283.236 To registron assessed assessed venrly \$500,000 in January.... Martin torpeds place dives 5,000 feet aucesstelle win 1,000 ib book . . . Clarie note builds from area above Expenia case against Wycering and Unik state par tange. There werenes sole at Econoroli Field after one day's instruction. Frank Hawks revenue. eventioner in towed glidar. . . . Basing

delivers 37 P-87's to Army ... Detroit

Public has sirplant squad . . . Air

smart hangur-complete with office

He tells jest how he's doing the job on

slicky goo a thing of the nast.

Our Plying Equipment section this mouth is loaded with new clanes were

socal, feederline, and military. In the

servered Sold details and abstractable

of the Johnson Rouber 187 are store

on one 174, Also, Srat sketch and

structural data on from Shalash and pary models are presented on page

pary models are presented on page 126. And in the frederline field, all

available data on Howard Harbor'

new 18-passenger pick-up craft is given (ones 173). Then is the millnery field there are new design, main

terance, and operations does on the

Nevy to fictation all bear to

"One a fined best operator make Rodds answers that one on page 171ent by theory but by citing actual case histories. And he sheers have it can he dow without coming a ben lies. for certifier the continues to the six port iss't the whole deal; they've go to warm to play and come facts arren Since markly halfs which are not sol smallractive bet sometimes downight dangurous, can really drive consumers away, the article on page 172 gloss the MARLES N. HUNCAMP, boad of the De dope on a new "minute seletion" that Department in Engineering of Curtis Walght's Mr. Leads plant, for had a world waterproofs separed runwant to make of varied superharm numbed lefts \$5 comes

since enaduating face MOV to TREE and a may easily be inequired, be's still planty heap free in, by's found time, by Serving the mid-light all, to propers a thought-pro-stree for median framport sirently is which he moreone (page 124) the questions "Why Mane Upon Fore England" Donnies A.M. Investor (name 125)

And this is a frethand acceptanter Sich Combat Crew Training Wing to not the story.

Daws the Years to AVIATION'S LOS Corne see Shee seems and \$700 000 cp. flosh bornh. . . Tevan gilder borne No. 1 usued to Pt. Worth

16 Yr. Apr (1939) -Mend Alexadi bill passes House. . . . Congress favors Exist formally amounted Greene Air Perce. . . Germany plane trans-Arlantic Zeppelle service. . . Navy reserts ats 1934 people was \$0,650 Fourtees over senative tolly before Congress ... Training Separation Two . . Army orders instrument from structure ... Congress plans air force 1,367 planes and appropriation of

\$27,170,000 for new silverest . . LOT.

designed DG-Ps from Pohker, European Recessor, . . . NAA calls seem

governors to except aviation

Bendix PRODUCTS DIVISION

AVIATION, Apr. 36 ATLATION, April, 1945



A SPACIAL TRUDENCY for figher plan to this ore. Kollman Marinews Mariness Allergan Ladence, The based scheet prince receive over the data of the indicate green for the contract of the indicate of the indicate green for the indicate green green for the indicate green green





PIPER CUB





AVIATION, April of STATION, April, 1945

GOOD FYEAR AIRCRAFT PRODUCTION REPORT

HOW GOODYEAR AIRCRAFT CORPORATION SERVES TH

1. As respective major 2, by designing and 3, by re-arguments 4, by building

AIRCRAFT INDUSTRY

WIATION, April, 1945

CONTRACTS : W535 AC-29319 DAW 555 AC-1044 W33-038AC-2407 W555 AC-21061 NORTHROP P-61 (Black Widow) OUTCO WING DANFIS FIFVATORS RUDDERS CONTRACT RECEIVED : SHEST REPORTED NUMBER OF LIVERING AND COME.

ATTATION, Auch 36



DO A GREAT WORLD-WIDE JOB

O'NE of the big stories of the war is the magnifector work being done by the commercial strikers and their civilum corns in transporting vital cargoes to the from common of the mesh. Then have exched the monorous of victory so many a distant boulefield. They are blazing new crash fee America's postwar supressary in transwhether commercial existing

Goodseas is never that a year bish necessary of those hig world-ranging transports are equipped with Goodsear sireless time rubes wheels and brakes Paner. the ico-counsed recovers of Greenland to the Misteriou and of Africa this farned "leading com" has record in standout dependshifter and depthiller under the most

difficult emergency conditions.

That is why it will pay you to specify Goodrear ship tion rates wheely and brokes - sides the Control Madelade Disc or the new completely supposed National Disc of the new completely automatic on Disc - topscher with master calinder hadrance in and connections. This allianar combination assures better-below marched units engineered to meet the most the specifications. Our engineers will be also to said in referring the proper type of Goodburg tire, take # and brake to meet west service requir Goodsear Accounties Decarrences Alven II or Los Angeles 54, Califo

That is why Guedpeur equipment is so widely under

AN ALL-STAR COMBINATION CONCETTAN ARE THAN ARE AND THE GROUPERS STATUMED DOING THE GOODPERS ARE THAN ARE AND THE GOODPERS STATUMED DOING THE GOODPERS STATUMED DOING THAN A CONCETTANT OF THE CONCETTA THE COMMUNICAL LANGERS WHERE, COMMUNICAL MELTITLE MINE MAKE The above equipment is which used on large multi-engined transports. Consequenthe serve organizated in which's used on high media-neighbor transports. Confidence hashing the wife water of conf. designs, then wheel and brake union. to exact any operational many

Sanufacturers, Airline Operators, and Private Flyers depend on Gospiese for-1923 - TORRE - WHERE'S - MAJERS - AMERICANT MORE - PROPERTY MORE - PROPERTY - CALABOTS - CATANAC MATTERS - CATANAC - CALABORAL OLDERS & CANNALE MATTERS - GREETER FIRE AND ON CREEK - ROOMS - CHEMISES AREN'S - BEST

METER MELANDES - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - CHEMISES AREN'S - BEST

METER MELANDES - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - CHEMISES - SEETS - BEST

METERS - CANNALE MATTERS - GREETER - FIRE AND ON CREEK - ROOMS - CHEMISES - SEETS - BEST

METERS - MATTERS - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - CHEMISES

METERS - MATTERS - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - CHEMISES

METERS - MATTERS - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - CHEMISES

METERS - MATTERS - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - CHEMISES

METERS - MATTERS - CANNALE MATTERS - SEETS - FIRE AND ON CREEK - ROOMS - ROOMS - CREEK - ROOMS - ROOMS - CREE NIED WIRMOND - OLIOCE MARKE FAND - PURE AND OR CERE - RUMENTED PARTY. - AND OR CERE - RUMENTED PARTY. -

GOODSYEAR

AVIATION, AND STATION, AND 1946

$m B_{ackground}$

of LEADERSHIP

AVIATION, AND HE STATION, AND DEL



continuous practical research













SET ASOUND THE WORLD SO FIRST THE WOLLD OVER I

You turn, precious cargoes of food cerry in supplier that formerly had to be dropped by land planes . . . make wer - medicine--americ, most be uncertal delivery" - noise to resint of through to the men who fight in be deep raugher and remote recontras So comatile have those featherweight - of the Far Fastern buttle fronts There wishely anathered formula a time. Their needs are constant... advagent. But pathless tereson makes neged supply too slow, uncertain. There is prob one may incorporately. flore, the small L-4 "grasshoopers".

support with Edo Scote, are proving

on Landing on "mod puddles" -- is

scaplanes proved—in supply work, in receiver inslated sirmen and ground fighters, in securing information of enery josts Hathons-on extensive towning and development program to the use of peep susplemen has been instated at Fort Brane, The 10rd Green Arnifery, Brandler General Jerome L.

remote and inacconsible spets—they

Walters communiting, in the unit or-signed. Limitemants J. F. Denhart and Robert C. Krebriel are the six officers. The training area approximates actual conditions overseas. Liamon piloto tion techniques....................... to anticipate almost any combat problem. The road to Tokun is long-and work. But our far-sighted reflicery leaders are making it shorter and supporter and toucher for Jaco cale Contribution in the process are the Edo-epripped L-to . . . little planes do-

402 DECOND STREET

Special Deliveru



Demograt. Dayles

GREATEST NAME IN AVIATION

AVIATION, AND MATTON, AND 1845



IS. OPDISHING

A Job Analysis NOW will help you get Setter Tools and Sadam Court

DELMERS RIVET SET

CHISELS ... CUTTERS ... DIES LATTE

TTERING TOOLS NISHING TOOLS

Even in plants where everyone is satisfied with tool and die life, surprising improvements are made when the Carpenter job analysis plan is put to work. And the best part of this job analysis is that you or one of your men can do it with year little extra effort and get-

· Better Heat Treating Results

RIVET

· More Pieces Between Grinds 9 Lace Machine Dawn Time

PARLIS PINISHI

RIVET SET

a Lawer Tool Costs

BOMTEG TOOLS

OWERLING TODIS LATHE TOOLS

9 Lower Preduction Costs



This 3-Stop Job Analysis Plun Gives You BETTER Tools and LOWER Unit Costs)

1. The Way to Match Tool Steel to the Job .

Reppose you are hunting for greater longitudess, more wear resistance or greater horselving accuracy in a tool. With the Campenier Metched Set Method you can eliminate he questioner that comes up when you must select true docume of loot steels. The size Campenier Metched Tool Steels shown on this diagram will solve 50% of the problems that come up in your loot room. And here's the best part of this method of job analysis. With the diagram and the Cargoniter Matchaed Deal Steel Manuard you can actually predetermine tool performance on each job. The Manuard contains an Obpoge Tool index and Steel Selector that quickly points to the best starting place on the diagram when you have a tool to make. The Manuard is free to bod piece in the U.S. A., we for your copy, just drop us a note on your company letterhead

2. How to Got Retter Hardening Besults . . . The second step in your analyses of each job is a check-up on heat treating methods. For proper heat treatment improves hardening results and induces todaing costs. It also contents your test deems and steel relations recommendations.

2. And New to Reduce Unit Costs . . .

Check on tool life and output per grand! Every time a tool setup has to be torn down, you took a bod lake to be made over, costs back up By many the Corporate Methods of And for personal help with your tool steel job analysis program, on't your Carpenter

And for personal help with your too uses you analysis poogram, we your compenses representative. He has the kind of engineering experience that can help you unswer the question: "What are my tools and these dring to production code?" The Cornenter Steel Company : 128 W. Bern St., Panding, Panny.

arpenter MATCHED !!! TOOL STEFIS



AVIATION, April 1965 MIAYION, April 1945



Ready, willing and waiting . . .

For many two decides we have been recognized by the criticis industry as a children between the dischargement engines and explaness. If some two are criticis not destinate between the contraction of the source of two many times and takens have been devised braggle in the production of specially accounted of our cent relation and originately an enterior destinates were as also to an initiate relationship with our practions trade. It is taken, the Association from enterior destinates and the contraction of the contraction



ENDINEERS & MANUFACTURES OF ALECHARY SPECIALTIES .



coder 60 persons. The feet book hors a connective for E bears of continyour bester operation. Ford rapply will lest langer when heater in

Date on other models with less and unaffer expection is evalua-

Control (cycling switch), High Lin Codich. Datey Artiss For Subnel Lamp with rwitch, later

into your plane

SECURE heater in position, plug it into an elecside of the plane. Thur's all there is to it. Now sir around the engine. your plane has beet . . . even if it most's originally You may operate a believeser, Six-directional motion makes ram equirment sufranible. With the

manuferely self-consisted units, designed for use on so 15 000 feer abbuds. Each model is equipmed and automatic controls. You don't have to build scoops for cam air on your plane, because both circulation and combination air is raken from the interior of the plane. With a 40,000 Bts output expecter beater, you have at -65° E. conside temperstere, heat equivalent to a ram-operated heater of 125,000 Box's, because you don't have to hear on arest-volumes of incoming cold siz. This means savings in bester size, weight, and feel communition. And you can have been on the empay as well as in the air because Insirred Portable Aircraft Heaves

These new Institut Portable Aircraft Heatres are

operate independently of plane engines. Think of the Possibilities !

When you carry passengers you have comformble heat. When you carry cargo you can remove the heater and use bridge other narroses

Your engine refuses to start in cold weather. You lift out your heater and direct a stream of warmed

right runs and size of Ignirrol Portable Alcorate Heater no olane motion nor ram air is needed. About all your assumance of countline andulus. tion is the fact that these beginns Heaters operate on the same exclusive whirling flows principle which has made Janitrol Aircraft Heating Equipment so constandingly recognist.

The development of new methods of heating and their application to many nate is one of the reasons why industry looks to Surface Combustion for progress in hesting.

Our Engineering Stuff is ready so discust the antification of Instruct Aleccusts Hasters for your requirements. For more information on the issess Janitrol developments, write Surface Combustion, Toledo 1. Ohio.



MAKERS OF

WITEOL About and Puristic Names a JANETSOL Grantual and Air and Compley Personne, Unit Heaters and Companies Surrow

Heat-Treating Personne, Special Atmosphere Governoon and industrial then Burners a KATHARAR Hamildity Control Systems

The rest assembly consists of a

terrener newed statistics; steel becoming.

Criffing.



Steps up Horsepower



BLLY Submerged WATER INJECTION PUMP

turnel contact impletion. Engineered for

wide temperature supper with heat helps more excisive dissinated. This dissinated

heat, teacther with agitation coused by

called velve discharging directly into took.

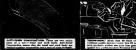
Here is a fully submersed owns that gives elecraft engines on obvadance of extra harmoneway when meeded in on amorgency. No rebber of valuable room, this seems regular last them 150" space on astride of tent for mounting purposes. If supplies water or water-alcohol relatures ers unserted in the combustion chember. The corregion problem has been

also areally reduces freezing bazard. This new Romer Pully Submerged Wester Injection From to elen grantiable with somercharger connections. Write for details. selved with special internal Illustrated is 20 0500A with supershormer



ONLY Firestone TIRES GIVE YO HESE PATENTED AND EXCLUSIVE EXTRA VALUE FEATURES WHICH ASSURBLEATER SAFETY AND LONGER LIFE





TONE AIRCRAFT COMPANY, AKRON, OHIO - LOS ANGELES, C

Firstone

Averagy, oir lines are placing for postwar super-nirliners that all in the bluepriot stage. And the operators will rear the iller for the safety of 100 or nagers on every take-off and

th giant planes will need the ries that man can make and oney can buy. And that means as the Champions the only rices built with extented and construction features which extra safety and extra strength Firestone has come such remain developments as the first rubber airplane tire, the firm tread tire, the first low-profile non-wheel tire and many

of Firestone research, And e the planes now on ords row's airways are ready to one will be ready with river vill make them safer, more

Hearton Shy Champion Law Pressure Tires or leading wheals and tell wheels con ght weight with unusual strength. nes Aircraft Tires on your nest



STATION, April, 1942 AVIATION, April 186

Strong, flexible "muscles for GE aircraft systems

These motors and power packages" are the "brawn" that swings our turrets, opens bomb bays, positions cowl flags, and performs other flying and flahting functions.

There were designed by G.E. in problem and on gueered systems for various types of sircraft, and are built to provide the highest reacticable power/weight ratios. In their wide-rance adaptability and combat exceptional performance characteristics troifs the components used in still other G-E sixcraft systems ignition, die nower sanche, assessatie niles. In your design work, there's a good chance that one of these systems already developed by G.E. can be

adapted to fit your requirements. If not, we believe our wide expensesce with applications of stress drive, coursel, and generating equipment will sould us to develop a new system which will fit them excel-At any rate, we'd appreciate an opportunity must you about some of the proschilities we see for applyities of developing something entirely new. General Bactric Company, Schenostody S. N. Y.



residable in both closed types for continuous or intermittent date from 1/50 to 7 bp at speeds of 1750 to 7500 spin Fouriers include: seed shell for rigid construction. abordown and shields for light wearbt, field windings of Torner' marner wire for resistance to seize and overheating. All motors are "run in" under their own

power, and record individually for performance.





















and is unaffected by weathering sirereft. This wooden plane has been singularly successful as a fighter and bomber. It is said to have a ceiting of thirty thousand contours having extreme curves. feet and a speed in excess of 400 In every far-flung theatre of miles per bour. war "Lucite" enclosed hombers De Post"Lucite" methylmeth and fighters are belying haster scrylate resignsheeting is used for the day of Victory . . . on ships both cockpit and bomb-aimer's like Bell Airgraft's tet-propelled

course makes or "LPCTL" should not of the side kinder. which provide he produced whose descripted out to the rest.

GUPOND DU PONT PLASTICS

Northrup's P-61 Black Widow night fighter and a bost of other

R. J. do Post de Nemoura & Co (Ire.), Pleation Dept., Artington. New Jemey, or 5801 South Breat way, Los Anneles S. Calif. In Carnada: Cornelies Industries Ltd., Box 10, Montreal





ers go over year war tiess motor requirements with

EFERT S

ELECTRICAL ENGINEERING AND MYG. CORP.

"These "envelopes" of Alcon Aleminems brazing sheet are automatically formed and folded so that they slip together to build up the heat exchanger shown below. Dip bearing to prompting models of the

up the heat exchanger shown below. Dip the breaking, an operation requiring only a few minimum, then joins them and the heusing into a cipid, par-tight mail.

When the dip-breaking

sently's as easy

placed the original gas-welding method, asseathly time was out to a more fraction. Many manufacturers have discovered new economies with Alexa Alexanous brazing

abeet and the brazing process, Our engineers
will gladly help you fit
both into your products.
ARUHINUM COMPANY

or Alessaca, 2182 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA ALUMINUM

ATIATION, April 186 STIATION, April 1866

method of assembly re-





The Electic Stem Nut were the bend. It has what it takes to stay put in a coupling, no matter how touch the operating conditions. Book into the bond of some Klastic Step Net is a lecking device - an cheffe compression relies. This collar ferms itself to the individual bolt thread, evine it tight.

tion, sheek or impact.

washers or any other assillaries with their attendant increase in specubly and servicing costs. And you can turn them my to the torree there. No backing up or straights to find a cotter-pin hole. They can be used sore and sore arein vet still lack You can use them on one

Salas College March Street St. March S. M.

ANTANION AND THE

The not won't boson up or back off under conditions of severe vibra-Here is positive insurance against loose wats which will result in re-When you use Klastic Step Nats duced coupling maintenance costs.



Worth its weight in Black Gold

Then driffing for oil : . America's block gold . . . occaterel breakdowns see almost inevitable even with the first of equipment operated by experienced men-And such breakdowns are costly in time and money. But's why the behaveter reviews can be worth to would and more . . . when most on an error more merer to righ unvently needed replacement ruris to the same of drilling operations are currently makend Firth: postwar belicopter, used as a cargo carrier, will be ecurated to every loads comparable in wright and hale to the capacity of a medium motor track. And it will need neither roads, roas, nor looding facilities.

No matter bow cough the termin or remote the seen the belicopter, operated by professional pilots, will tremport freight, supplies, possengers - even beave machine parts, safely, multily, and economically. For on the besis of cost per sut-exile to lecisted points. behooster transportation is almost unmatchably low. As McDeevedl, right now, our man sab is to make places, parts, and plastics for way . . . all we can as frot so we can. But we're working too, on a consechensive believeter developmental program . . . to offer you and your organization, postwar, that specialized transportation service . . . adaptable to almost any type of curpo . . . elmost arrowhere in the world.

M.DONNELL Aircraft Corporation solutors of PLANCE - PARTE - PLACTICE . SAINT INITE MEMBERS . Seamless Steel Tubing...

Brings Many Machining Advantages

merhining required, Lighter then ber stock, bring to

discus, afficiant the wall structure to the chapmeteristic acquired for cell up-selfing, procking, himsels, himsellay and other operations. Michigen mechanical hobby:

Item speeds and liberary teel lib.

one and amosting under corefully controlled con-

Const Michigan engineers on the suitability of taking for any machine pe COLD-DRAWN SEAMLESS STEEL TUBING MICHAEL MICHAEL PROSTRE CONTROLL



SOUTH LYON . MICHIGAN



SOLTON MANUFACTURING CORP., WEST HAVEN, CONN

RADIO SHIELDED IGNITION ASSEMBLIES

STATION, April, 1945



Man's Genius for making things is limited only by the physical properties of the substances used to make them



seeing through which the year shift lover causes into the transmission case. Its job is to give positive proletter so that no freeign material ran proude the teremission. As with all Sirvis products, everything

majarer's specifications; special soft, flexible, high tensie kother was carefully chosen, tanned and treated If accordance with a Riceia formula developed by Chicago Rawhide engineers; its manufacture was subget to right laboratory control; and the finished rend et is the result of 66 years' experience in processing letter to protect and seal ultal machine parts. This well delivers uniform and constant protection under

temphost service conditions. If mechanical protection is your problem, why not from upon Chicago Rawbide's unperalleled reservoir of specialized engineering experience? If uncomed per-

shock or vibration is demanded in packings, washers, restorts, combines or valve discs . . . Chicago Raubide

research can develop the properties you require, and careful renduction control can sesure the most exact processing. For precision performance in protective coverings and seels, specify Sirvis mechanical leather.





PROVIDE A BALANCED PRODUCTION LINE FOR FAIRCHILD CAMERAS

At Foliabild Comerc and Instrument Corposition production lines require quick changes in operations Drillion, topping, recruise, and counter-boring of all stees of owned comerc parts are some of the importor tobe quaiqued to Walker-Turner Drill Presses. These record, ample tools are readily moved from one depertment to enother, or within departments, as zeeded. Decurate of Wolker-Turner flexibility, oil operation changes can be made quickly - requireless of size of part. Thus a steady flow of urgently needed current ports is requiremed.

WALKER-TURNER CO., INC., PLAINFIELD, N. J.











service Positie-Western Into here providing the conparation for the providing the providing the behavior of the size of the providing properties for space of the providing one of the size of the providing providing providing providing the providing providing the providing space of the providing provide providing providing

gation.

PACIFIC WESTERN

The state of the Spherick part of the Spherick part

perceive, humbling corrective action.

of liquids, and its ability to stand

the colf and he ready for instart

service wherever and whenever

ADEL rating are basted at preserve

for succeeding requirements.

poppets, statefess steel for conshells

and staining stead for all critical

workloss marks—baset-translated to mu-

non-least service life... arroard mirro.

finished, topped and polished on

marketty designed ADEL sendoment

to come standardienties, inter-

changeability and top performant

couring market office.

for information was negreet ered.

below 1000 or aller

motel eithe? Here's what

browne man, military and room

from need perfect performance of

hat pignes no matter where they





"WORLD TRADE is The Road to World Peace" says JACK FRYE, President, Transcontinental & Western Air, Inc.

NOW is the time to plus the world air system of to-morrow to it will work constantly for world power and nows. For air commence between the markets of all the mid within much of more aution and makes it advantamus for every land to remain on good terms with every the, unce all will buy from all and will to all the others. Brooms it is poor business for a nation to go to wer ask its heat continuers, we will have in international our falls, Mr. Pren. Ent if aviation's great potential time for peoce and progress are to be prefined, arisation's place for the future out he said to the U. S. "test pilet" market—she arrowanded make you are habitatedly first to account our change for the better. transport one of the soundest supports of world proce. " dad the only requisite for developing such world wide commerce is freedom for the international airline to suck out its own most fruitful level of sucfulness and service - feedow for the olding to earn its year by its own fall contribution to woold benefit unknowered by monomply and appropried by subside. It is an apportunity which must not be neglected. It more not soon come again."

perty for planes and for our transportation), Handreds of thousand and their predents, Whonever they fir, Trux fire too, Look second you the next tone you are traveling by place and see for

Believing that the obest of avantous's leaders are always of extreet to the axistion industry



An Economicai Rofinishing System for Surplus Planes



Berryloid Fabric Rejuverator provides the ideal material for refinishing comouflaged military planes. It seftens and plasticises old dops through to the fabric, restores tautores, and perceides a perfect have cost for Berryloid Piemented Done, available in 27 system for used planes. If the fabric is still serviceable, Berryloid Pabric

Used with Berryloid 405 Dope Cleaner and Berryloid Pigrogrand Done, this new material resvides a fast, economical, highly againfactory finishing

Ask any Air Associates office or write us disa for free bulletin.

BERRYLOID AIRCRAFT FINISHES

BERRY BROTHERS

Leading Producers of Aviation Finishing Materials in War and Peace, for over 30 Years

People who make Collins Radio design and precious high quality radio con-











A few of the more than 3000 specialists with

dies Radio Company, Coder Repide, James, 11 W. 42nd St., How York 16, N.Y.

in technicisms who wire the critical r.A.

dende to the emitter unit we could wing

market must be boosted on | terral said

I'S one thing to design a superpreciation product
-but M's a far tougher job as design to for Take one evample—sixcraft instruments. These complicated mechanisms have more precision than sion instruments are cultime of the sender. tion lines of a run that was sentitudy improvedble until Jack & Heises engineers redesigned them for

These sum there away the rule bunks. Working hand in hand with production specialists, they sinplified denga, figured our new methods of mancture and assembly—linked downs of problems that had been renderties burdenecks. When they seisbed, they had so ultra high precision product that could be moved out in the mass quantities seeded to keep up with the growing damands of The same engineering job but been door or doesno of other vital warriers assignments—many Just & Habris See, Cleveland, Ohio, Honotestavara of advances angles extension, generators, gree pilots

of them still on the secret list—in Jack & Heists regionsing inhocatories. The net presid has been preser quantities of precision sircraft equipment Valuable as it is in war, this unique and effective maintenant ability holds exact promise for peace. Already, starting new developments are on the way from the minds and drawing boards of these men who wone's rake on for on sagreet. Look on book & Hoters for botter things for firing!

JACK & HEINTZ

AVIATION, April 180

AVIATION, April, 1945



tene matic

TLETT-HAYWARD DIVISION

<u>ME</u>RI<u>AM</u>

L dries manufacture of the control o

The first season was provided for version control of the first season of the first sea

The foregoing and many other features are on indication of the expert concounties of this lestrowest. It is a unit mode to inapples with the volved flattice healtheast of quellity as got flats in dependation, assumes, and convenient to wars—greatly froblishing testing.

THE MERIAM Pastrument COMPANY

ASK FOR Buffetin 27



The Aircraftsmen Functor Used on the

Marieur Stranger



Showing Factories with New Locornel and



To Next Tipbecard and Cleric Hold Severals

Specy Marsing and P.51 Fighter spile; is expected with the regioned mor spanier is incorporate a number of deserve-1. Steeple in Design. Country of free; and rear services. Rugged, 2. Spot Welding is used for exemple and associatest of control 2. Solld Bulkhand prevents sir pamping action through blade

"On the Nose"

of every Mustana is "Aircruftsmen The complex and excepted my our persons quick acting of Incircult Coldsons.

2. 20150

A thebroard Engineer bolds the real sections accusable and securely murday. Lawrence up or eight non-requiring less than one minute, per man speck removed of most necessor for necess to propellies

Other Applications The control AMERICANTINGS PASSENGE his many other applicaroom or crackings, gas becoming and other sexceptile assembles. We will

THE RIRCRAFTSMEN CO.

TED STATES

carefully Trees Bears Cables are tested

AMERICAN STEEL & WIRE COMPANY

COLUMBIA STEEL COMPANY San Francisco

AVIATION, April TATION, April, 1965



W/гн тип Sperry Gyrosyn Сонрам This flight and paviration instrument you can do just that! It rives deadis a Directional Com reachonized with heat indications ... accomes murrorise the earth's magnetic field, providing headings ... is without mortlands recount stable indication under all conditions error, oscillation or swinging. And it of air turbulence. Write our Acronia does not require resetting tical Department for information.

SYROSCOPE COMPANY, INC. GREAT HEEK, M. Y.

OS AMBRES - SAN PRANCISCO - NEW CHIEF

WEGSCOPICS - SESCREDICS - SADAS - AUTOMATIC COMPUTATION - SESTO-MECHANISM AVIATION, April 1888



THINK in terms of Magnesium for most efficient weight-saving...

Profit fully from meanestum's veright-environ abable he plannens sour denotes around thus lightest of the lightwoods metals. When you seek to improve performance by cutting out medana malabit Maula Macanadara Products ofun. you strong, dependable products.

In Maulo extraded shapes, like these shown here makes or relaced awardly where recovered

Therefore the use of weeh shapes reduces weight even further and current be cost of structural assemblies.

Whether your depon cells for manneston castings, footings, shapes or sheet, you'll get meximum dependability by calling on American. Marrostore for these products. Absentours. Company of America, Sales Agent for American Magnesium products, 1713 Gulf Building, Pitcherob 19 Pennsylvania







... we'll help tow Joe to TOJO

ONE IN SEVERAL MIND NOT THE BOLD. STREETING DICK MANNES - SAREA INTEGRAL WIGHT - MEC WELLING

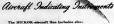








STRATION, Auril, 1942



trical thermometers, radio compass indicators, tuning meters, ammeters, voltmeters, landing indicators and shunts.

Noted for high precision and fine accuracy. HICKOK instruments, made for more than a third of a century, have always been held in highest extrem.

THE HICKOK ELECTRICAL INSTRUMENT CO.

16525 MUPOUT AYENNE . CLIVILAND S. BUIG



It is reported that New ideas in highway busers in-

pde : separate engines for each driving wheel, hydraulic transcomes increased use of aluminum, 50 pasenger capacity, two decks, wider ends and steam power. Business pet reedy with CONE for temperor A new process deposits a cerus ting covering on electric wire set made upon CONF by temperary

A new steem-proof wire for rural electrification is made of steel wire record with copper. American Steel A Ware Company est made with CONE for temporary About 10% will be added to the country's cold storage capacity if plans to use a 12 million cuber foot sestone mine for that purpose are successful. Food Industries. get reedy with CONE for temperary

"Molecular distillation" is now out. of the laboratory stage and processes to do such incredible jobs as to perate fish oil from its small McGrow-Hill Overseus Diseast. est costs with CONE by temperary A hardware wholesaler carrying 50,000 items plans to set up a chain of "caletera style" hardware stores

after the war, Groupe Worthington per resty with CONE to temperary Claims for the near home heater developed by the Effermineum Coal stitute include: one-third redustion in feel use. 50 heavy of heat in one stoking, cost under \$100. To parallel this development, Anthracite Industries Inc. has a furnace 2 x 3 x 3 feet that weight only 75 pounds. It consists of a tube with

the coal entering at one said and seles forced out at the other. Coal er met min CONE be temperen A new surgical lamp properts a cose of oftenviolet radiation, through which perms carnet pass, around the month of the con-

One of the large oil companies so es a motor jubricant claimed to be unaffected by temperatures from 00 below to 200 above sero. Cites

bet reads with CONE by tenserer A new stirring device is driven by sternal roter by marnetic attent. per reedy with CONE for temperary

A large trucking company, oper ng is eleven states, plans to seld sur est oction as soon as plane are available. All States Freight fee. er med with CONE for temerrer A chemical company has produced a solution which, it claims, will prewest runs in stocking and may be applied with a spenge. Messes

A fashlight, in which hattery, bulk, and into are cent in a cylinder of war, is said to be chesp enough to three to be in the second to the ea-

Charicatours, Mass. est made and CONF by tanasans The electron micro-malraer w ports on the atorie compression of particles too small to be seen by between Secretar of America.

est made note E.O.N.E. by temporary In war planes the present type of ngine is twice as efficient as jet protwo are equal at 200 miles; and at 550, jet propolaten is twice as all-dent, EMPIC No. 7.

set made with CONE for temperary Steam buree, now being desired. appear to have many advantages, including smooth operation, so idno fumes, low conviting cod to brokens, and longer service ven overheads. But Trees

YOU SAY TIME. when you install the new Hartwell Flush door latch

Harrwell's new, searcless seed, flush door larch eliminares the slow, redicus removal and replacement of inspection and account doors. Because of its farr action, it can save as much as 90 minutes in the inspection of a single plane. In flush Installation and positive lock give it a multi-

tilicity of uses. to addition to importion and access dones, sircust manufacturers are specifying the Hartwell flush latch on radio panels, baggage compartment doors, emergency exit door places, caller cabiner doors, magazine racks, upper berths. The Harrwell latch presents a smooth, flush surface; spaces. It can be used on doors of varying sizes, shapes

and married and with or without a flush hinge Simple in design, it is inexpensive to produce, and can be supplied unmounted or sporwelded to an installation plate. Single source for 779 different sixeroft production ports and reals

> HARTWELL MATE Creambary Soutermed, Law Angelon 14, Colli Sulley, Town - Stringth, Hillar, - Kompan, City, Kompan

Made of Stainless Stort Redesigned for greater

especial, the new Harrwell deah down buch. 11-1660, is now being made of sampless seed It is merchangeable with the instal Harrwell lect, H-4523, Weath & on.



or less, opening on twin bingrains, provides a flash, spleah-proof fit, Spring loading congrain the degree of correl, Standard since 1 h. and My in. Other sizes made to cedes. ---



ceafs, ignition cable must perform minisfacteelly under all armospheric conditions from sea-hear to coiling, in all parts of the world, and under supid changes in advitude, bumidity and temperature. It must resist the decreicesting effects of corona, abrasion, oil, age and best.

Packard high altitude aircraft ignition cable meets these requirements better—and lasts longer—than any other cable. Where the best and most reliable high-tension cable To produce this finer sircreft coble, Packard engineers, in cooperation with the sir forces, sisteral finalizers and sittings, developed a tough, synthetic robber sheath over a special dislectric insulation, with a rainforcing set besid between. Packard cable delivers the current when and where it's needed.

Packard high-altitude sircreft ignition cable

is supplied with either copper conductor (No. 530-E) or stainless attel conductor (No. 531-E). You're right with Packard cable.









Warre and tell us any problems you

may have on precision parts. Here, in

one organisation with two great plants.

own ALL the facilities the most complex

production problem requires . . . frees

engineering skill through all phases of

machining. Long before the war, ode

performance carmed top rating in the landacty. We've "come through?" makes

polycomante earlied top rating is the industry. We've "come through" make total war output . . . and we instead to stay at the top after Velovy! We may have an open capacity on your requirements now. Ask our Recentive States Office to mail you a headest covering one complete plaint facilities.

With Tolorunces

This Close, it's a job for

Aeronautical Products

• THE MCCESS of the decompiled Products. Inc. Beliespier, designed and built by our conresponse, premier new occamplishmins in the post-our age of Right.

HALL MA ALL ZHOM

Van d



blades hardened seconds The job is to harden only the teeth of hand back one blades -with 6 blades completed every 10 seconds, or 36 blades The arraying speed . . , securacy . . . uniformity, all come with radio freezency heating at \$100 litu's per square inch per minute. Compare this with the old method, at 5 Deu's per TO THE PARIO INCOURNCY GENERATOR senace lock per mirute. Similar birk smoots are nossible to every metal breating taken annealing, hardening, brazing, sintering, forging and soldering, though passi. Large startly custom provide toredy mobiler. And the heating is an simple that al's a "read heaton" ich for unskilled hele

Another great advantage comes with Westinghouse design . . . a single shielded cabinet contains generating equipment and

creatrols, ever to install and maistern . . . requiring a minimum of space. Westinghouse Radio Presuggery Generators for induction or distancia heating our available in siste different standard since Electropies at Work

up to 200 kw. with a range of frequencies for all but the most record weeks for added information write for Description Data 85-800. Or, for aid on any specific application, sale a Westinghouse engineer to call. Write Westinghouse Electric & ing Co., P.O. Box 868, Pittsburgh 30, Pe.





Liquid-level-indicating Equipment Equipment of the paper of

BECAUSE the fuel tenks of the different types of aircraft yeary widely in size, shape, number, and location, the fuel level instruments which operate excessfully in one type of plane are seldom usable in another. This applies especially to the remandries. General Electric bas, therefore, designed and built several hundred different types of transmitters to most those

When our facilities are no bresser needed for war, we will continue to build many designs of aircraft instruments to meet your specific needs For help in the selection and application of G.E Seriel level indicating equipment, write for Booklet GET-1056. Por an evidentian of the theory of operation of the various systems and detailed descriptions, write for Booklet GET 1185. General

Electric Company, Schenectedy 5, N. Y. BUT ALL THE BOHDS YOU CAM-AND CEEP ALL YOU BUY

GENERAL ELECTRIC



MORAINE POROUS METAL

In their a gives for Mangian Parious Despit in your product? That's lard to say. considering that present applications of this soliver control over sort, distinctive the product of the same state of the same in religious to the same state of the internal substances to protein the control rules, explaints when that compensary superior of the same state of the same pariotic off from the religious descent fraince-and flow our particles in the old lines to adaptive their particles.

topicing, Ty these hardway Meyensley,
Perput Metal brings the advantage, of all securately controlled possetty, diffusion and security possetty, to the property of the security, and the support of the security of the sec

WAR BONDS SAVE LIVES

DATTON, ONIO

MORAINE PRODUCTS Division of CENERAL

U.S. Carrier Equation Nature Grammon Field at:

Grumman

Sets New Standards for DEPENDABILITY and TWIN-ENGINE ECONOM



Marines flew their first fleet of Commandos from San whose operation economy carnet be matched as fit Diego to Honolula in 13 hours ... 2,060 miles nonand medium range flights that account for over? stor scross unbroken waters. And, each Commando of all domestic air trovel. fice at a gross weight of 50,000 lbs. In such graciling Combining twin-engine economy with a seating reoperations as Midway, the Gilbert Islands, Tanasca and ity of 36-42 passengers and 526 cubic feet of of Solpon, Curties Commundos sped vital eurgoes of troops arece, the Commanda should som the sirline suit and supplies-everysted the wounded. Yet, in fifteen a maximum net profit from the anticipated jost mouths, the Marines never lost a single Communic. Under the hardest of pounding in this and the other Wright Corporation, Airplane Division, St. Look. theorems of wor, Certise Commandos have ailed up invaluable flight and exercting experience which Curtice Curtiss expineers have used to full advanture in developing

the Community to its present high stage of perfection When the Commando again "done its civries" as the

world's largest and fastest twin-engine, houry transport. sirlines will be offered a thoroughly proven sirplane

Passed the toughest tests ever given a Transport PSs

LIQUID PACKAGING

for Aircraft Parts

A complete line of rust and corresion preventive compounds for the protection of internal and external surfaces is mazafactured by R. M. Hollingshead, a major supplier for Army and Navy Ageraft. Applied to plane parts and weapone by spraying, swal-

burg, or dipping-depending on type-this "liquid nackngreg" eliminates the risk of rest and corrosion from factory to battle-line . . . is easily, quickly removed—if removal is

Your innervies about these Werz protective compounds -which meet rigid Covernment specifications-will receive prompt attention. Our engineers are ready to work with your engineers in designing special chemical products to ment your particular needs, R. M. Hollingshead Corpora-

tion, Camden, New Jersey; Toronto, Canada Also makers of West Hydraulic Pluids, Compounded Lubricants, Lubricating Oils, Paint Stripper, Cerburetov Cleaner, and Clearing Compounds for Aircraft.





Porus - Krome protects the wear-zone

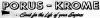


The executest were in Direct and reaction exercises in on the cylinder walls in the some traveled by the states and rings. Corrector from the products of combination and have and shouring and the difficulty of adoptate lubrication all contribute to the rapid wearing of the eviluder wall. These contributors to short lift in outlining bores cannot be eliminated, but their results can . . . by the explication of Popula Known Posters Known is hard, nore chromium which is applied to extinder hopes by the national Van der Horst process. It has tiry pores and

changels in its surface which serve as reservoirs for labrication oil, finding it back to the gurface as no ded. It reduces correcton and wore and multiplier cylinder life 4 to 20 times and since

Experience in actual was confirms test run and engineering labors one results. Wherever continoons, hard service is required of an engine, Poster Xucory service mester engine calicality Write today for the correlete story of Pomps. Excess and what it will do for your engines.









AVIATION, April 1865 STIATION, April 1866



CLECO SQUEEZE RIVETERS





PNEUMATIC TOOL CO.

3000 PSI HYDRAULIC EQUIPMENT

PSI hydraulic systems. These swelve basic units-models built and recol-

PACIFIC DIVISION ANNOUNCES the suggest that Pacific Division's creative engineering first complete line of equipment for 3000 to developed over the past seven years in building names that has made this company headquarters

are the result of fources morehs of research and it address to the emissioners illustrated, these development. They incorporate all the proves 2000 PSI units shortly will be available: Sequence Valve, 10" Accumulator, 1/2" T.S. 4-Way Selector Value and Relief Value

Weige today for file folder containing complete deep on these 1000 PSI units and which is available to sixframe engineering personnel. Pacific Division,

Bendy Avission Cornoranos, 11620 Sherman Way. Nonh Hollywood, California.











or hydraulics.





















ALUMINUM REATING falue discovery of the way to brose this shaming

delivers of boot trecular voits were limited to use or august in conventional shapes unless they reinforced. the structurally week copper. That's because soft solder and with copper - even at its best relatively low in mistance to temperature, possure, vibration and shear - can't stand the uneven stresses resulting from de-NOW DESIGNESS HAVE NEW SCOPE

Catherin discovery of absentages braving given dosensor greater access in planning the shape of heat impairs printed states in patricular 1. All-elements units save 14 the weight of couper 2 Heat treetable abresieum alloy tubes storel up weaken corpor. 3. Absolvers allow braning material is several times higher in resistance to temperature, pressure and

Se it's every to see why USAAF designers gave several surper of Clifford Feather-Weight Oil Coolers and Count Redictors a chance to make cool in several trees of siegraft LOOKING AHEAD

Birts now Clifford's production is devoted exclusively

strine then soft solder

we entomotive, besting, cooling and ventilating apsubment Clifford Fouther-Weight ... Save is the weight ... store met and slope Clifford Manufacturing Co., enily Ferred Sollows, write: Clifford Manufacturing Co., 541 S. First St., Boston 27, Mass.



alloys are chosen with care Pure metals and many allows are usuatisfactory for bellows because they lack the recessory spring proper-

tice when cold-worked.

A hydrachaelly-formed bellows — made by forcing a cold tube between the pinter of a collapsible metal dis by internal hydraudic repurers - musicus a matal of good deep-drawing properties and reasonable resistance

to compete SOLON BRASS IS BEST A brane consisting of 80%, copper and 20%, race is the best after because it has excellent deep-drawing properties, is not readily-subject to "season exacting" mostern received erring-action from cold-souther.

PHOSPHOR EBONZE ALSO GOOD Next in importance is phospher bronze containing as-sentially 90% copper and 0% tin. It has properties similar to bram and is more resistant to covenion. Where resistance to corresion is more irresortant than

resistance to mechanical fathros, cooper-pickel series allow have been encountedly used for believe in best CLIFFORD HAS ALL THE PACTS Clifford first to rendere businessically-formed believe

for industry, has knot alreast of neutrons in matels ... and is therefore equipped to supply you with these uniform, pretested believe in all practical ellays... either above or in highly engineered assembles. For good that Chifford is First and the Foot on Hudyali-

FOIL COOLERS AND COOLANT RADIATORS







sider the transferrent the steering wheel taken

disanges in temperature Take a good look at it.
If it's modified of Lucrarith E.C. (ather) relia.

Not a sign of warping or shrinking no splits still pray as a dis. Surface, perfect . . . feel,

Particularly on meeting wheels and other

erge Insect moldings, Lamarth EC delivers.

relationship proof of the value of its elight extra

ges of this solvenced Luxurith plants.

-

out. Design engineers highly rate the advan-

ity maintained permanently throughout ex-

frequently exposed to damp weather and

weigh, howe quantite gravity . . . ideal to medding ever nestel, alongsitou equatry more than nelegrate to incommendate different organcies. Bullande clottedly and persuasari authors bull. a coloque on the Lumantite hardy of palatic is coloque on the Lumantite hardy of palatic list only one of the Lumantite hardy of palatic list only one of the Lumantite hardy of palatic list only one of the Lumantite hardy of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the palatic list of the coloque of the Lumantite of the coloque of the palatic list of the coloque of the coloque of the coloque of the palatic list of the coloque of the coloque of the coloque of the palatic list of the coloque of the coloque of the coloque of the palatic list of the coloque of the coloque of the coloque of the palatic list of the coloque of the coloque of the coloque of the palatic list of the coloque of the

dree de Octobers Corporation of America, 186
Madden Armen, New York 16, N. Y.

21 etc.
24 Celanes* Plastic
25 Plastic

Plastic

hope of the information product angless

to the se country on many on F is reach.

JET PROPULSION

A CLARE



mainly blaber speed senater majetress

FOOTE BROS. GEAR AND MACHINE CORPORATION Dept. G, 3225 S. Westero Blvd. Chicago 9, Illinois

FOOTE BROS





· Riveting · Piercing Pressing · Pulling

CP HYDRAULIC POWER MACHINE

CP Fower Unit will handle any number of CP Work Units operating simultaneously, up to the sequestry of the hydroxide power unit. Cylinders available in different sizes and especifies can be equipped with a wide variety of yeles, CP Work Units are light and compact for pressures developed. Supported by a CP Super Safety Beliances and a nivide shift, CP Work Units superiors can quest, Write for con-







Secondon' in some form . . . from solid vibration so heavy shock . . . is present around every electrical connector in service. If according wire provide efficiency decay or service more and coards

How, then, can you be sure the conceptions you make, in your product or in your plant, will avenue unaffected by mechanical abuse? You'll find the answer here in Eurody's corner chamber where connectors are 'pronamed absorbed a classical absorbed basedone'

Hour after hour, they are vibrated at varying frequencies and amplirade. But in addition, very measural methods are excelered an add shorts represented twisters well. After which their electrical reviewage and execution are conclude measured to make sure there has been no change . . . that ther

These physicals are but part of the thorough not procedure here in the Burnely teleprocession all aircret on amore that were circuits or employ ment ruffer no connection workles in service. If wou don't have the Bornely

conder, let us send you a copy, Burney Engineering Co., Inc., 107A brackeer Boolevard, New York 34, N. Y. marine familie shakes states also







The "Green"-Paintiff AT-21 trainer and paramed reseased-

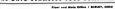


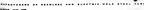
ultimate tensile strength. If and address the best year about product the OLIVEO solds

affine coursed were CHICAGO A. RESIDUR. . . . Chris Charac Malp., 50 H. Washer Drive LAM 14. 0000 Anna distances Miles MINOR & MICHIGAN Stay & Grand Made ----MONTHLY PATTER CANADA NAME AND STATE OF PARTY OF PAR PRINCIPLE S. PA.

170. Carl., Carlotta. THE OHIO SEAMLESS TUBE COMPANY









THOUSANDS of impairing domesnew Bell Average Adjusters One reason is that the helicopter presides a kind of Kirkt we have always sought. In a heliophier, we can en straight an sideness or bushmade All these there

draw a line between netheriness for the

helicocerr and realises; danking on when

croft, an adocraft with an importure post-way

behaves will be graftable Ball Aircraft beheves in the belieupper, be-

impossible in a conventional airplant. one he done in a Arbenberr with suferand precision control. And that accesses for the questions . . . THE CHITTON OF WHEN ... It is burd to

are eradiable floa-believaters are country nes question or coat ... How much will expeer hads, the volume of production and The host Rell behaves on however, will not be in the "low peops ou" field. The many that the fast believes will

de. In address to the other advantage for example, a behouser doesn't need alaborate copper washer" with ceffing and visibility believes for hancous mamours. For such sans, the cost of the betreapper will be of less en shelter to operate at low, sale speeds. Learning behaviors will come with

mentioned solder down to WHAT CAN YOU DO WOTE A STREET Bell According feels that the behavior First, it will be used by reduced one Second. the believper will go pay a

> make it possible to use them may at and to specimes prior and obserwave only dependable als toront man weather. And Smally, believes will tees the grown! market. Bell Aircraft does not believe that the has eather that it will over on a see will recupsed field of flyers, a new fi nice of Siphs.

If you would like to know more, all creins develo conselles de full bille

kind we expect to market, any non available work, which is Rell America come about of ALCOY CHARLETY . . . One of the most

insportant characteristics of a heliconter in subday. The Bell Assemb believes that it

& Res Was Road, and Sand State

Specialized was for the helicopter are many and varied. For example

Me for particularly work, over dering, that book for each, short book for exemplical corpus, department atta count abstract, haden then for extended orders are not form of the proper which had no benefit begins and white, passed to each store of two places which had no benefit facilities, and eather. RESIDER ASSCRAFT WAS PRODUCTION COUNCIL ... MANY COAST, INC.

Bracelee (F-39) and Kaugarina (F-65)-65 CREMANCE MANAGE Rouble Goe Mounts and other ordered

S-20 Storing Designed Superferies

AVIATION, AND POULTION, AND MA

Does that Wew PRODUCT regulre a fractional harsepower Special Application MOT

3 REASONS why it should be considered in the EARLY STAGES of Product Development

> 1 To allow ample time for thorough study of the application from the standpoint of torms requirements weight, and space factors.

9 To enable the motor builder to use his full resources of skill experience and incompite to designing a motor that will insure the best motor performance To make full use of the motor

builder's renduct experience out of which frequently comes suggestions

Our new 42-nene catalog contatator specifications, dimensions, and other useful data will help your engineering department derive the full benefits of considering the motor in the early stages of product development.

THE LAMB ELECTRIC COMPANY

Kent. Ohio

PRACTIONAL HORSEPOWER MOTORS

Phillips



Phillips AVIATION GASOLINE

AVIATION, April DE TIATION, April, 1946





detion for the bearing Due to the design, molded nulleys are universally light thon sheet stock pulleys. Lorningtions can be combined with managed

material providing higher resistance to splitting. direction of the laminations can also be changed meet specific requirements as in the AN-P-60 style. Formica molded pulleys are ground to equal rim bub thickness In short, the molded pulley is lighter, stronger of

Formicu's experience in producing molded pull began with the first use of these pulleys and has be nuous ever since. It probably exceeds that only other producer.

Capacity is new available

for the assessed association

of molded mellows to even.

tity. Send your blue prints

for queterious.

ANOTHER RECORD - BREAKER TRANSCONTINENTAL RECORD BROKEN AGAIN

IANHADY O BY APMY'S ROFING BUILT C-97. WRIGHT-POWERED, AC-EQUIPPED

For the second time in nine months, AC Ceramic Spark Place fired the nowerful Wright engines in great transport planes that shattered all transcontinental records. The latest record was that of the Army Boging-built C-97, January 9, 1945. AC Ceramic Spark Plugs were pioneered and built exclusively by AC for the Liberty engines of World War I. They also shared

records at home, but are serving in bombine SPEED FINAL VICTORY - BUY WAR BONDS

in the epochal flights of Lindbergh, Maitland,

Acosta and Byrd. Now, backed by 36 years

of "know how" they are not only breaking

and fighting planes on every front.

AVIATION, Apr. 10 stravion, April, 1940



Complete BEARING COVERAGE WITH

FEDERA THE FEDERAL LINE IS COMPREHENSIVE AND COM-

PLETE IT INCLUDES HIGHLY PRECISION AND OTHER TYPES OF FINE RALL BEARINGS FAMOUS FOR QUALITY, STRENGTH AND ENDURANCE,



MIEL DED

In early days many great men looked to the shillful fineers of their women. folk for the extra face pregre of their cloth, Today prostrouty manufac-

turers look to Lawson for the precision muchining that insures quality performance. It can be said that precision machining is one of America's milet natent "secret wespens" in this war -- we remoken it will necelerate post-war progress when the eraftsmen of Levern's can belo you in acception manufacture.



LAWSON MACHINE

Harnesses for Water Buffalos - - yes, WHITAKER makes the



450 Control Pulleys on B-29 Superfortress Ride on Needle Bearings



If YOUR production needs include

* WIRING HARNESSES * CABLE ASSEMBLIES

* RONDING HUMPERS * CARLE OF TERMINALS

When you're carring the world's erestes barels lead backer, faster and suce, you want the 450 pullers your coursed cables ride on to function

amouthly, efficiently, and reliably. There why, abcard Bosing's great B-29 Separfectress, each control pulley same on a Tourisasson PN rome andfriction Needle Bearing Terrington Nandle Bearings are utilized because they more than meet all the require

tion operation—and allege reliability Described dams on this and other an plications of Yorrington Needle Bear our is available for your engineering tier You'll find a helpful in solving many a problem of friction elimination that comes to your drawing board. Send for your copy today.

TORRESON CORES - NOVEY BEED 25, DE No. 744 Person Processing Survey Greaters has frombes to



AVIATION, AND IN AVIATION, AND HEL

load capacity, subilier, case of ages frie-TORRINGTON NEEDLE BEARINGS

-- you'll find WHITAKER a dependable source Just so the Water Buffalo is accomplishing great factors by produce even the most execting with things on land and see so are Whiteker Harmessee tabs so economically that we not only save?

and Cable Assemblies Investigate and YOU TOO will find Whiteher is a dependable somme

We have ample production facilities, a quarter of a century of experience,

skilled necessari—and are able to esti-

WHITAKER CABLE-CORPORATION

time and oried but SAVE YOU MONEY.

In addition to an engineered will

service. Whiteher also offers a stat

condially invite you to write and air

line of standard cable products







IN YOUR PLANT

LIKE SOME TERRIBLE PLACER, rust spreads its min oververbere. Assembly this thisving demon costs American industry more then a billion dollars? Until recently, rust has been accepted as a secondary evil in many operations.

Today, thanks to new developments, various alle one obtained a SHELL ENSIS DUST-PREVENTIVE COATINGS

As protection against rain and snow during ostdoor storage, or birth humidity conditions isside, Shell offers a complete line of Shell Erain East Presentium. These oils fluids and compeands come in various grades, each designed to meet a specific condition. Protective continue Time from this tressporest coverings that need got be removed, to continue that resist extremes of weather over land periods.

SHELL TELLUS RUST-PREVENTIVE HIRPICATING OILS

Where moisture is a factor, Shell Tellus Oils are recommended for machine lubrication. These scientifically developed oils cannot remove rust builtein, cost inhibitors, they afford protection against the formation of rust-this without loss of lubrination qualities.

Call in the Shell man. He is a trained mancomputent to study your operation and advise you. Let him show you how to keep rust out of your plant. Write, wire or phone -Shell Oil Company Inc.

Street, San Prancison 6, Calif

on West 50th Street, New York 20, N. Y., or 100 Bush



Military overloads lamore safely on nylon tires



Even Boeing's Superfortress has increased its bomb load with stronger B. F. Goodrich tires

N IVLON CORDS make hense size this figure to at least 95% within a numer of weeks, plans because they are attempted, and because, for the name load capacity, they are lighter.

How aylone increases "psychoof" in three

copacity, they are lighter.

In most cases order, uptons weigh strong the same as deep subsequent of the same as deep subsequent of the same as the sa

While the smalldated "retirge" to league arrows the large arrows the thought of his charged delta "arrived loads" according to the large arrows the large arrows the throught of his charged delta "arrived loads" according to the large arrows passing or the large arrows the large

ber of plan.

Today, sil 5-6-inch tires are
made with aplot. In fact, at issus
1975 of all military steers are now
converted to rapice, and other
converticat are being set up to
Akron, Other
Akron, Ot

All made by B. F. Goodrich

Expander toles for brokes - Propellar meditors - Deiners - Gremmets - Pegine mesons - Hydroslic and Feel hose - Control seeks - Process-confling alapses

Skyway or Highway

B.F. Goodrich

FIRST IN RUBBER

from America's LARCEST

to America's SMALLEST

the new BENDIX disc brake assures safer landings to the new BENDIX disc brake assures safer landings to the new beautiful to the safety of the



endis Landing George Bondis Promisentis Shock Strute Bandis Stratone Wheeler Stratone Book He Master Cylinders and Power-Brake Values make up the list of Bendix Landing Goar Equipment ATTATION, AND HE

AMERICA WANTS PROSPERITY

BOOK to he published early in April by the McGrew-Hill Book Company carries the proweather title "Prosperity: We Can Have It If West It" Its authors, Memra Shields and Woodof state in vigorously challenging terms their conas that the United States will among from your A horsen, material and technological passesses adaso to provide a netico-wide standard of living preferred in world history. They research too.

here beented our economic past.

ster arclairs and serid direct, for the book deals in from greatle fasheon with many of the currently mak. It examines, and discreds as effective purrups of prosperity, whatever their individual sperits we after grounds programs for public seases above create, subsidiring of small business, foreign losses, sel insurance, definit assurance or section, personal des of process. the represent formation for reconstant a bossiv-subsected admirations that reserves old to nothing and allow exceptions to take its on untrangueled by controls of any bond On the positive side, the back wrotes clear recovers et of the fact that prosperity, under a system of men enterprise, depends permantly upon the extener of competitive incontaves that your qualital leavested to provide better took and emisment, that over organization and technology to larger continuby increasing productivity per man-hour of week, d that enlarge markets by producing what the

h that, prosperity depends upon positiable and conduct business and complayment opportunity, so becomes the next of enhabtened government, busim sgriculture and labor policy to promote those were which will forward rether then retard the for sen of expanding production. Reserver great the room for discret upon the ademay, or the phresting, or the special recommendation of state book has one vistue of may, so the phraning, of the specific recommendations ald marit. It attacks positively the problem of what the should be taken to arbitree and hold consensity "ther than merely deviates a restlice to be excludhas end if we run leto a decline. Trinsity all responsible spokesmen for government, and for bearmont, labor, and agricultural groups, are agreed upon the goal of prosperity. Moreover, they sarree Cast, inputer as possible, it should be achieved thereigh the effect of private appropries, with givernment intervention utilized only as a last resort. The despite this unesimity, about all public discussion of the problem has ecceptrated upon the nature, the extent, and the timing of such povernment expenditures an may be found necessary to combat deflation Since upon this execution there is for form second sense of divergence in a field in which, so far as fundamentals up, we all see to second to exite an transpual degree, No replication should be caused by the fact that the

the smooths very combs not furth will olicit both onpresently current phrase for promenty is "full explayment." The latter phrase merely states the goal In terror of human values, which are rood terms to which to state any goal. What matters is that we propertily are accreed as to what we mean when we wan that we want prosperity or full renderment. Not only do not become what we mean, but within your rough keets we can give describe to our concrete. There see a few whose appraisals are acceptual lower, but meet competent entireators not the coals for about 1850 et an average aprend employment in crylina tobe of between \$5 and \$7 million persons, with a group national product of between \$185 and \$200 billion measured at 1943 price levels. This contracts with the 1944 level of non-realitary employed of 51% million. and a gross output for the end of 1944 of over \$200 billion. It assumes a reduction of the average workweek to 40 hours It will take pome such levels as these to provide econologuest for these who need work with colo rafficient "Iriotanal" unrenderment (those terrographs lated as uncombosed because of the named transcence between tobal to affeed reasonable labor-courtes flow-Bility to both workers and employers. The necessity tary employment foreres are senerally consistent such the officially stated nostway and of take for 60 mellion workers, since the latter farmer is recognily understood to be an estimate of the labor force, which technical members of the armed services and an allowance for

> There are a purpler of resource why the estimates connect be figured more closely, and why no one can be were considered even of the validity of the stated limits The chief secese of doubt to the employment estimates relate to how many withdrawnle there are likely to be on the part of women, oldstern, and voyanateen, who now are in the labor force to a number more than 4 millions havered normal expectancy; how many man will be retained in the armed forces; and whether the

nearthern frictional unamedowness should be calculated as accommissed the current I reillion or the 3 realism an listed in the properties year of 1920, Additional uncertainties eloud the estimates of gross national rendert. Notable among them is the fact that no one to more of the wor's effect upon manuhour productivity trends in view of the fact that half of our oursest. current has eventated of vendoots that had no substantial emplement in our peacetime price or production erries.

Nevertheless, despite such qualifications, it is fair to now that we do been a seneral concention of the magnitude of our posturer goals. Although they are well within our production submittable as democstrated in this war, they are formulably beyond any province record of neacetime asharyment, Only the most sunsuine entimien could lead one to expect that they will be achieved without concerted will, planning, and coencrative effort. Only blind recklessors sould enguader confidence that once attacked they will automatically he held, let alone expended in pormelly healthful growth.

If we were to follow nest patterns, our war-built boom would after a period of uncertain length, colleges into disastrons decreases. The very magnitude of our recent mustb would contribute to the death and duration of the subsequent trough. Yet a full even to the level of our previous peacetime-peak-year 1926, has been estimated by The Federal Reserve Board to imply unemployment for between 15 and 20 million persons. If human values have respectance, that in asserthme that must not be allowed to occur. If business values have importance, we must not tolerate again such losses as occurred from 1900 to 1901, when sales over the four year period were \$120 billion less than would have been provided if the 1929 level bod held, and corporate profits declined from more than \$7 billions in 1929 to an everage angual loss of \$1 billion over the next four years. A repetition of these

effort our prevent them.

playment.

In Jacobs of this year Senator Murray introduced to the Speats a hill contribed "The Pull Employment Ant of 1965." It instructs the Descripted to submet to Concess place for eliminating both unormhorment and reflation imbedies measurementations for correctare not and the amount cable on these amounts on any others it may wish to consider, and after weighted vides for an advance budgeting of the constituent sorts of a full environment economy and commits the Fortand Commenced to receive in advance for sufficient expenditures (through private contractor channels) to make up for the gap between estimated private expendivers and the execut necessary to some full our

By no stretch of the impatination out The hot s. playment Bill, in its present form, be regarded as contable to business. Yet it may well present a terwhether or not American business can deal with the lems to this area in a statementike fashion to statesmanship will consist in demonstration fire a the Bill is not accountable because of deficiencies at preclude the possibility of its accomplishing the sennurvous; and record, that business is able and seven to offer constructive suggestions for remodellar as

It is easy to point to weaknesses in the Bill. To use tion and a few of major importance. The mount make advance Federal expenditures to compresse estimated deficiencies in prospective private error tures is completely impracticable. No one in the one try can predict future trends with sufficient areas for the surpose; no one can tell what the occasion marts of a really high, stable pencetime hydret shall be, for in our boom-or-burt economy we have as so pattern to project, no one can tell, within research limits, bow much the government should mend a a eases to source full employment. The Bill recessor labor's right to work without defining consumer remonstitities which it should exercise. It due to defens the areas of aromated deveragent execultions such a way as to alloy business fours of surery compatition or the greeral public suspicion of in raking. Above all, the Murray Bell is defective in to describe a somewhat varue tropouncement in favor forwarding private business activity, at recommonly stoole meetle designed to supplement such aster rother then etimulate it. The very deficition of certain of these faults out their recentles. But the notifive task of station bey to Ball should be assended to coder that it you her effective unefulness is far from simple. Yet it is me

appeared by imbustry. The Committee for Economic subservent, which has for some time been water intensively used the problem, and which is excellent responed to offer sound and progressive edvor. abouted he used for this narroom. American business carroll afford to take a rest attitude toward levislation in that field. Some louis turn undoubtedly will man, for the problem is me t which there is a grave government responsibility le upon all citizen evaness. Norse of them has more to co or loss from the rise or full of remements than Atterior

> Muce H. W. haw. M Proplets, McGroup-2003 Publishing Co.

SURPLUS-

The Industry's Sword of Damocles

TATAN BACK IN THE BANK when the Curtiss the effect it has on the manufacturing industry. Any valuat for small aircraft there was an eastwe distributor for a mid-western manufacturer who second a system to stretch the rapidly divinding wooly of war purplus OX's. He ferried his places is from the factors-which an intermediate sten in beautimals where he substituted reconditioned parties for the new ones in the planes, then stocked dose new ones for sale to his customers or to the manufacturers. In due course, justice coertook him. This is cody one of the suits that arose from the market condition often the last man. It had many turic results when young men acraped up a few delice to have wer surplus places which had been

sating in their original crates for meanly a decade dut flying was far more dangerous thun it really we even in those early days. Now we are faced with a surplus problem of far couler represents the thorn that turnels following the last try for more than a decade. If we do not hundle natters realistically this time, the manufacturers the shoulders of those government agencies charged with just as well shut up shoo and eo into some other headness

A PARADY WE HAVE LEARNED that the cost of reconditioning some simpleses is far eventer that that of new ones. That is not surprising when you realise that our production methods are the most efficient in the world. The same holds true of automobiles and many other mechanical devices. Recurse when it is less expensive to buy a new one than to is true that the process of remodeline or reconditioning airplance engines, or equipment creates a trial many man-hours of employment and if you hele at it from that marrow view, you less night of

thing that impairs the munclastering indentry weakone our six nower because the industry is one of the basic elements of air power. Actually it would be far better to destroy a substantial quantity of sircraft and equipment outright than to allow it to bung industry and with it our national accuraty The difficulty of selling the American transvers on a policy of destruction of war surplus equipment is fully realized. Yet the actual cost of preserving it and rebuilding it may easily be far eventer than the

supplicing our als nesses is invalvable in dellars. The cost of the present war in lives and money is the orice we are paying for allowing our defenses to sheep after the last war. If the entry by metroveron that the public can be led to second these facts. Obviously the job carrow be undertaken by the industry lest it be accused of self-interest. The eraponoidality of showing the taxcover that a senacooble amount of service destruction is naturally in the cubbs laterest rests accorde on

with the surolus problem. It is these approvies which must have the courage to slove the facts and fleures before the American people with such clarity that they can be understood and appreciated. Efforts in this direction will be occoued attenuously by well-municy but shortmirberd advanced of economy and more perfounds by subsyculus elements whose object is to have unhave now description in all process. But if our opposits ment aproces succeed in surmounting these hurdles the whole future of aviation and world neace will be much more secure.

Yesli E. Vierle

MEASURING THAT FEEDERLINE MARKET PART / OF A SERVES

By JAMES G. RAY, Vite-President, Southwest Airrorn Co. FWY HIS YEAR may well be one

Thus the major question to which the Board socks an answer in the vol-

it lumbly the use of trush line for-

lask of similarity in the two types of

Nevertheless, new rotthods can and

have been developed which are beof the most important in the lieved to accurately predict the probhistory of scheduled ale trans-erration, for during its seen the Civil able amounts of traffic feeder systems would reporte. Their application to Accounting Board ambabiadle will the geographic regions preposed for service shows conclusively that comcomplies with populations of as little nation's availer cities and towns as 2,000 (or even less in curtain isolated access) will presente sufficient traffer to support feeder lines.

onals have been held as recent months and a rember of others are acheduled These formulas begin with the acr traffic records of the region being studied. The 1960 CAR severy is the The many advantages of further crpanding our domestic air transport system notwithstanding, CAB rightlogical one to use, that below the last year of popul traffic conditions seeding expansions which win approval reser curbed by war. A basic air reward inbe justified by "public convenience dex or factor can be developed for any "; and a very large part count crade tree by exemples of its of this eligibility is concerned with cities received our service in 1940 proof that the proposed service will thus dividing the total number of namework, or the total volume of real reports sufficient traffic to support generate suncices trans to support comments for carrying aircraft rate population, to obtain the ner

for different trade areas, dependent in the minds of Congressees, the aviaother circums sense for which has tion industry, and all others sincerely eils, the factor already contains an ad outport. However, there are some ferencia, sixualy stated; Will the ments in the second of the this haue factor a modelick by which comment to makent direct six services the traffic notestial of each town can Over a needed of years the existing be measured. Possibly the first modification of the air carriers, or trust sirfines, beve debasic farner is the introduction of an measuring the resented market alone adjustment compensating for the fact that 1945 traffic is being measured by a proposed new rouns or afforded by a

capita factor.

a forestella hazed stoom 1940 date. Demail, and expense feeder siefine system termining the amount of increase for wave which to have a similar formula. this success is suspendent difficulty A is in operation does not obvious sho number of composhensive surveys have need for feeder applicants to originate one that gives an housest accurate nicbeen made, and want have been used by leading aviation industry ture of the great new air transportsofficials as bases for profictions that tion market existing in thousands of content air travel will be accordere from 200 to 500 percent greater than smaller communities. Nee, as some anstreams assuredly beyon assured, does

in 1940. Moreover statistics can be developed which back up a still greater increase. For energie, penninger traffic foresand 62.5 percent more

This factor will wary considerable

and 1940, Between 1940 and 1941 it. from he requisitioning narious seed ment for military use, but invent he here permitted to increase as the No. 1940 ratio of 62.5 percent groups for airmail, passenger totals in 1943 sha That the increase in the impation protwer period will be of comidents conveitade in further ledkrated in a fact that the war but brought a roun

acceleration in public acceptance of the transport; that many technical and an revenued improvements, as well a opin from small contextualities in the veloped which, to turn, should here are supplied when underlying remones a state of the contextualities in the veloped which, to turn, should here profess antine fares; that large sunhere of rural families have recent up ceties and towns, thus increasing by strable assesses the 1940 Centra who words all the products, professional strable assesses the 1940 Centra who works and extertainment its resirecins must be based; that trementur reserves of income have piled up a hanks (a large part of which, asset ing to many predictions, will be spor in treard); and finally, that are is crease in the number of coluts aread

by sir setomatically will read a courses use below reads of that tonroot facility by people living at sen. There in view of all those facts as source that 1945 traffic will be 20 percent greater than 1940 is very en-Small Towns Are Good Markets allow for the fact that smaller tons consistently penerate more traffic all recognise to their size than do de

large cities. A survey of the I that the 21 towns beving population Learns for the entire country the of less than 10,000 produced some if secont more passengers per in then the averall average, In the is-West the increase of traffic for to smaller towas it still greater. The 2 siriles stres emeraled as average of 412 consensure per day per 1,000 per-By communiscen the four statio baying less than 10,000 popular averaged 1.22 passengers or new

three times as many, and the five is to 10,000-25,600 population group at counted for twice as ween in 10 000 recode, and these exceeded to revices average by 56 percent repassengers per capets. The couple shadeness are shown in Yable L.

It is then apparent that the band trade area factor should see he seein to all communities irrespected if mi without further adjustment. However, the amount of veriance is valid prothan did airmail where between 1935

mail gained 348 percent. They have the country's most experienced operators shows how to allies open to air transportation. First of a group of articles wering all phases of fooder siriles operations.

> retion per capita, will have to be deversized separately for each geographical ages. Probably in most parts of the marry the factor used for larger cines

all send to be increased by at least Il percent for the smaller towns. The larger account of travel ner name. that the limsted economy of scarerage small city or town does not words all the products, professional bets may want or need Unlike their large city meighbors who have such can near at hand, residents of caryes communicia mass travel for tion to the pearest large city or reads

Nor is it surprising that peridents of the axailar points bove rande prountimally greater use of air travel in tion few instances when it has been mie avadable. This is because the major torre's ground transport in ownerstively poor in evert parts of the country. In is slow, befrequent, andbeing broad monthly to the wants of cost trade center traffic and the nepe pulse broomstat markets of the mainter 20 percent surradorade area seminate-inconveniently scheduled. In fact, or no next all management an hed a loarney of 200 or 300 ml, hy tain or less from an outlying commusty to its trade area conter requirmore tiese than one of as week as 1000 mt. between large cities having

nere adequate transportation 1924 these two adjustments the tale fectors can be specified to all comcontinued a proposed route to ob-Wines stope, bracing the development disposal trade area factors, are shown

in decad in Table II. There are other conditions in render, of movies to mindle overstables which will influence the amount of telic preerated by any given rejet.

still can be farmshed to the 40 percent of traffic "feeding" to trust line one-To evaluate these influences properly nections from these close-in communiof is necessary to describe the procise teres of passenger traffic that will be Contracted because come bears will be cent of the total preliginary traffic affected more than others by these cottinuos is made as a locale adjustlocal confilience

Passenger traffic frees smaller towns ment for all reviews within the Wheel three categories: I. TRUE PERSON TRAFFIC-montes by country trank sirling stations formall with treat the State to more distant

that coster from the satellite communi the for any of the recesse detailed 3. INTRA-TRADE AREA TRAFFIG -- NEWS ing to other satellite engage office without to a large city, driving on automobile on he descripted for each town or or taking a bus wiggin the built on arens makes for a slow difficult trip. trade area by a comprehensive state of hotel registration recover. The aver-Property it retained from 11 to 2 by, though bravy traffic to go from a age breakdown will be approximately 40 percent true feeder traffic, 40 per-

rices which affect the preliminary traffic estimates for a given community I. A LOCALE ADJUSTMENT ----the amount of influence is determined by the exterible assumptivis distance

from the trade area contact pendent open the number and sunresignes of the community's groun transportation schedules to its trade

The adjustment for locals results Afficie for the airclase to seen selfcircu time over ground transportation

Other Adjustments Handed The adequalities of profession that even half the tree feeder traffic would use his service for trips of less than 50 res. has been questioned. But much reasoning overleeks the fact that or attemptions to consumer with the airline for such traffic. Because the deer tiention morarally in the trade controls sirport, the downtown trainment time is present the second section time

motorial of all communities within a

Deal radies of their respective trade

eren centers abould be reduced by the

while a considerable saving of time

Then a reduction of 60 per-

saburban district, across the eity, to ity Then, to be able to drive to a searly local sireort and board a plane point directly to the trusk line terroles would be a great convenience for reasengers making trusk line corrections trace some of this type of traffic, even

visable for those opposition between 50 and 300 sel from the trade area censer. At this distance the simplesse





FLORIDA COORDINATES ACTION ON AVIATION LEGISLATION

By HOWARD W. HARTLEY, Aristins School, St. Patentine Streets Indopendent How a special pattern for action, adaptable for other states, effecthesis handed major aroung interested to the perceptifical future.... thus implementing a concerted drive to secure the best laws

Wage four James few bis the James because but to make their from St. Petersbury to Tarres America, Mexico, Coba, and the exone m a seemy New Year's morning in lands that frings the Carabban Sea. 1914, enrrying one passenger and a During the hectic year following few pounds of carro, the 3,000 second reaching Plancis from December to For West with sorres of suffixery are egineerial aviation in the United hours. There are 190 recognized air. ports in the state today, ranging from fances alimit to a creat on the Punian stroom two years after his hising stress to such manyworth establishtotal Finds but his stirit from an enceds no the army's Mariati and

by in the hearts and relads of a

ided together not only to preserve

of rities, commies, and private men ators. But the reterm of peace will the state could follow. find the armed forces absolving So Playford decided his first lab many of these melitary bases. In fact, was to bring these cross-corrects of some of them may be terred body to units owining, as referred by leaders civilian and commercial flower before the war ends, and many conserve charges believe that and over the military or bases and fields will be her of the association's national counreturned by the relitary as permanent These military bases have cost more million of deliars, and withdrawal of

cals, and the new base at the week of the Ranges River on Florida and

More than helf of Therita's seen

Army, Navy, Marene Corps, and Chief

ne network of airports belowe to the

Drew bases at Tampa, the Navy's gurthe armed services will give Foris sustance plant at Tarkapaville, its venty another are in her game of show-door poter with other states for post we



nercensation, bended by a neven-member communication. The superson model on he state's six Congressional districts the state a second congressions (seconds pensition and selected solely for sound knowledge of aviation in all its With the commission action to a board of directors, the new state departraces's administration of heavy regulation favor in Florida construction of new surports, anding, and allied

stunes to the field of consecutati

seen. Nature dealt Plerida ber

out acc-score of the friend wear.

the a pair of new does not come.

as not band. Early last year such remarked thinkers and planners as

thery Pinyford, of St. Petersburg,

moid War L set about laving the

des on the subject as ornores in a

the size discovered the

sted horses burnound to Florida's visit norses currently to riorious

account. Tampa had one plan, Miarel

but spother St. Petersburg still and

wound by realous but short-nighted used. The completer are property where some same letters on blowless

if all groups, to a common viewpours.

and to railed these under one barner.

of he beens building on VAA middle

up in Florida tuelre months aen.

Today there are too and combined.

has Jamped from the original 250 to

Once the NAA program was under

a Ortendo, That was early in Leasure.

the sessions, covering two days and

common ware attended by consecute

fru of the six leading agencies now

imminsing in Florida with an eve

toward preservation of the Justice Michigan to NAA the

he of these arencies includes Gov.

Milard F. Caldwell's consmitted on

symutics, the avistion committees

of the Florida State Churcher of Com-

mice and the Florida Junior Chamber

of Commerce, the advisory committee of the Civil Air Pared, the President

away Aeronastical Communica of

St. Petersburg, and the National Avia-

The clinic or Originals words a new

the cities at Orgando wrote a new

pure conference, there emerged a

become program to be laid before

the state legislature, which converses

Expresse of the arch of laws upon

which Physical and his collegeness

hipe to build the festure of communicial

end provide flying in Plorula is a spenahe creating a state department of

STATION, April, 1945

more than 1,500, with many new chap-

As possident of the Election section

sul Aerensetic Amp., and sure-

on few harders with the ARP in



Schools in which he suren shele. Day to Ale affects every different prosps interested to not welfed into single basis workles for sistile amount descript to describe ment of a full-time adequately sales int direnter. The pay would be sufficient to attract an executive of constanding ability and maternal remarking

References of state four comisto follow the nattern of federal wa-would comprise only a part of the new department's activities. The communica also weekd be charged with helvery arrolds offer though constitution with edies and conveles or work of landing strips along the prinfeel air conces that criss,cross the necessale. These landing string would be equipped with ecevericoccu for In addition, the convenience would make owner that all arrouts, both

advenuerance bendung, havener

Creation of a commission with such broad powers and manifold activities provid obviously sensing liberal days divergence of coince exists. Planets does not tax aviation gazolite, be the state recently sook a \$5,000,000 per-year right-cross to the treasury's then in War Mobelsontton Director tracks, both horse and doe, for the desired, seem morne and dog, nor the of revenue, provided the tax is for a good purpose. Se Playford and his

percentaged described in the state

"Taxes need not be heavy, "Playters

seclared in a verent recessing to the

Elected NAA "They reed mecals be

ent and record in matters accommand

cal Many signests and healthway have

through public subscription to com-

mensorate frying heroes of the past

Many more well be constructed by the

some means. Her many there will be and the one in existing will be

systems upon thousands of private

four who will literally durken our ayers with was street, day darwes our

be done is to correlate and coordenate

the effects of all Ploridisco-and our

ente will become an aerometica

done, and other narrange countries

tion. The commission would be cluthed

with absolute authority to designate

locations of additional fields tooking

sieges to factors of safety, acceptabil

printed to hear it. Name will object nt long as coldin tax money is was d for propositive development is Marry & verted from its original purpose—the Mexicol, return pilet shows here with advancement of existing in Plants 5 legalistics. Playford deduced: "Comspecial airlines will operate in and est of Florida in proportion to the amount of hunners conduced by their Batter. I am not worried on the score. Five operating lines have Flor and we expect other concesses to ellow suit. Take a look at the rear Florida projects into the South At lumic and Caribbean like a cises air craft carrier, with Misen at the popular and St. Petersburg, Tumps, Jackson ville, and Pensacola above the part and starboard rails. We have no mass airports today that the state itself car -ready and warting for the core recreied air floors of the smooth and the

Tips and Techniques For Alaska-Bound Flyers Yesterday's skytrall blazers found that the reased "Rosto" was a school of bard separtance. But today's Alaskan flyers out some new teheoff counsel from an "mofficial manual" authored by a veteran

ATC'er. Yalooble, too, for tomorrow's north-quers, are these tional feelings perfigent borge space and human admostrations. Pilots of the Air Transport Community un on your Esbano effentere. Many Perryang Dinision, which is comproblem arise on top of the world which don't wear down south around and some he as smothried and forth. its wanthoe, and if you think life in the north can be beautiful marks would right document that centains common sense-while retaining a real Americ better have a speaking acquaintance me planes and supplies to Aleaka. Before you that your morthward Protocod he a toronty 7th Economic delivery of planes and regulies you will Great teles (Cats Bishes White at about three losers before takent, and were to become accompany with the Preserves, N. L. now with ATC's pearly 2,000 cm, of land between Murevery effort is made to "arrange" the nife Har in Great Falls, Most, and for other cargo. the Warms Wheel or Evidously Althe atrasphilometric effect on what is side,-the stretch corresponds brown Accurrable and what is not bearing

The roots runs just east of the unio



other in fixing this northern reads. A



id John T. Cris. Engines Aich Officer for 1% Farrying Group AFC, the before a figure made from an old paracials and constructs more about from water bangle, about from and withing, foperaty after most the difference between the and doubt to a pilled formed doors in Almin's withinson. (Official ATC plats)

dent will overshoot very olim. Signs and weather reports free same freeman is the headqueriers of the misses when the weather is actually Alaskan West. Here the natures are alsomete for fireng. The frontal decisely friendly and the fermion to seather itself is food and often hange their best to assere pleasure latern, around for days. bread freezen. Whitehous, the next station, cause offer maps. Sequences are some replacement parts and he i orthodoxinoscen on the min-This brings us to sequence and eve. fairly large staff of mechanics. With the dat tell you what kind horse is beginning to get environd it of weather you would have is overflowing with gravel-against list if you'd taken off two and "feether-enerchants" appear at least ago. The important through the surrounding territory time they show is the weather At Fairbanks you and the one are Forey offers will be weighted, some. You might notice the term and stacked into a transport for dale proture and dew point

always converses, resuling to make, autors. No souther how you teen, defining affort to "get" you. The his de thermometer len't hidding

and Fairbanks, is non-californ using a sarry babit of charing each other

All the airports on the route ery new the front itself passes, a great

so big and the curveys so long an end of low, meany staff hongs around

only a character of very questionable as salleys and over the road. This

you are allracted to bear

You might keep as saind that com-

effect fast and disappears for a

sichle. While often it is nomible to

fy along the road with alliess being clouds in the reconstains to the war

and blue skies to the east, it is known

table to tell when the weather will tell

out over the route and cut you of a

need and live areally do never. In tentive cloudy conditions of extrem-

duration happen infrequently, however honor turbulence is common

mas diener, for winter and many

weather get all tangled up in carl

other and form are eccused. One do

may be cold and the next warm. If

morth. The nations are boost the rei of the year. Characters new to the

country start thinking they are raged

have been solder on the Hobokts ferry, they don't bother with run

whether They don't feel sold our !

the thermometer save by -40 dec. lst

sooner or later they will make their

inte addition to the enflection of de-

teched cars, toos, and other fitte

AVIATION, April 2007

trophies which one on hand at most

a good time to expect anything. Winter is the server of severe

Fall and cories are inclined to be as every and unpredictable as cost-

In success thembesteres on to

front, behind, or bush

one on the northern route must be lie

my is good, the country in beautig. In water, occluded fromts mayin the social life, except in Messay, you the Aleston low enstward have

ery back to Great Falls. This sendly send. If they are too close happens in the middle of the right ye are tiledy to get spread smooth Reneraber, the reporter weather stollers are pilots as nice even layers to make now patter for spart, and if you would get a good idea of the worther printings were the last outs the subject and one your De synostie man le e number chart in trebelcoler. mi producines man with the ale of a cuite board. A derector possessing perspi preservation can match the

mer the coute coate regularly. Even

persons to get an answer to te \$64 cocation; "Shall At Fort Nelson a night in the rode byse (two o'd) (see on as tel-close sleek as of". But taking a look at it a silen were necessary of who want to Meer your class before you're an old ton. If you are going to "take a ich", remember that the weather belad you is more important than the beefter in front, and that the most radigret reasonwer of all is the 180-

on. To be in between two socked-

watchies to a good way to make hell

the exists most of the tiese; so even

fough it to too dry-cold for wing lea

to the ground, it to no sign that you

wen't be fiving an ice-warren soon after

per leave the runway, being condi-

second for the every at 10 monage

In the winter a temperature inver-

sees copyright than it is already.

STIATION, ASSE, 1940.

If fewered down, don't five on related whose or all year stresseth will am he year need (Sinteh by Lt. Bull McClaushou) taxiour out for takeoff, and on heer wetter office reads: "Faxous last glasses at Education if you are weathall plays of year plane before takeoff. less, it spoils airfields, creates drag, and mercanes the takeoff speed. If front forms while taxing cut, go beck and get rid of it. Freeting of voor windshield but after takend in by tern. Of course, using a 180-deg. was it so good if the weather has Gued-in the station you departed

sir then that at the ground. You will Look and your side wireless and one yeer instruments; your windsheld High winds can pressionally be

all alriendes. They are just a minor

Afficially becomes and amountly one



but they are not difficult to swift if

was watch set for them. Find out

for for and arctic smake are two

reserves observes while they don't

limit vertical visibility, they man on

horizontal visibility plenty and materi-

ally increase one's chances of being

sested on a tree like a bot day while

trying to land. On the avound, snow

it find was.

tion alone is a great scerce of trouble. It is likely to freeze you-in the end Always probest your oil thoroughly noise on immer

sion bester, or drain your of for storage in a huneau where you check in over thoroughly you one-heat your place the rafer you are and the qualer it is In winter was will find that street lesk and tires tend to flatness. Check leaking strute for find level and be

not violent enough to form a reappr hazard. In fact, Vehron norther can be

Knowing an airplant is like knowing

a woman; that is, a considered

amount of understanding is in order

we deliver porth have less than tre

bears on them when they reach the

7th Perrying Goosp at Great Pulls

No specific mechanical

Don't forget that most of the planes

sare not to fill them too fold. Tires want he filled at moderate tenners tures, preferably in a hunger, sleep if cold air they will beat up when the wheels are extracted and are liable to on "home" when the dis seconds Contraction of materials sometimes accounts for bone fittiers and corners

Also don't former to dilete worse oil underwess, it is a tightish econosition. The most intelligent diletion proced-

MAURIKETING



company in first such dust of its Kind in country, pointing way to preader pursuant Sylvey New Horizons Opened For Aircraft Markets

Ton corn to plest fixed home well after Pearl Harbor, when the suvernment put he recrease so the first remains are new horizons. step to establishing an interceptor base. Creaty officials then expected bond lauer by the communities, or passenger of obligations to state or fed-Pattern for this new type operation which can be deshroad or advanted throughout the country, has been enphilipped in Weischenter County, New York, where North American Airport and 15 ye, in a deal by which the

county will realize a profit on what not

long ago necessed sectain to be a

Although the past 18 yr, had seen

pendevable aguation for a county sir-

over a read! WPA built emergence

courty white electrons

By JOHN POSTER, JR., Managing Edder, "Anarism

that after the war they would be presected with a complete field and it year made a great when late in 1943. they were advised that changing conand so would not set up proposed hambers and other facilities. Thus the employed which are \$600 4750 and 4.450 ft vs learth Since the county appeared headed men the auport operation business whether it libed it or not. County Run. entire Herbert C. Gerlach instructed One of the first throws he decreered was that there were nearly as many

deas on how to run an arrows as there were airmorts. One complex. tion, for example, was the fact the while it was known personal from would acrosse for a later part of the business volume, there was no way of estimating its ratio to activipend scheduled transport besidens. Moswhile, however, experts had been coning bangars and other necessary build. officials then knew what would be necessary in the way of expenditure. They know one other very important thine: There was a strong feeling in was a commercial verture and dynfore belonged on the field of private enterprise rather than povernmental

This meant that the county would have

"Afor considerable difficulty due to

lack of precedent and our own ignor

ence of the subject." Hardow and

and advertised for hids. We had plenty of interest, but most of it was serely of interest, but most of it was surely academic. Flying school opentern told on me would be made in said they were not interruped. One runngement firm neminated the spenmost impractical and impossible Pre-It was a obsessed service, then to fed four bids from empty oil com which exceeded the officials' not optomistic hopes. The concession was feelby secreted other several works personations, for each of the four recan Auraget Corn, agreed to spend

gunnations felt in but was best. over the life of the agreement approxicoasely \$900,000 for construction of all administration building, and count tower, three large hangers, second multiple was bargars, and guides stations. It also stated it would take care of maretenance on these unit-Further, it agreed to furnish of ureover normally found at a major street. enclosing surcrest sales and acress feel and oil sales, aircraft storage born orbind marrations, sharper and

arbeitaled surface reprotions.

successed coefreet backed by major all company clears way for ater nireary development—with more changes for sales, service of employment—without putting beavy formelet land on indiited fixed bose operator or tempovers.

4 there operations will be comadd by the county, which will repou states of unbeconcernantives o charter or rental, service charge a coeration recogned, and other Nesdester County, in turn, will on the amport, do rough contine to to benefit trees and constraint stores nior area, sewers and sewage disand plane, and an access road. It is nated these items will over \$400 and the county will care for

he source will be paid 74 percent

room receipts, parrent receipts from

due terbes sales, charter ticket sales.

of profess sold scheduled surface;

and a makement perment of \$480,000

a entration of the agreement-15

the surfects consideral per Errane

the the warmthe county will be on the buildings for cost less denation at 7 per comp per year. Such a deal moneys to be a cuttoral when the county and the old corn-Ut. a turned which can be followed smellen other consumerture On the county side, officials point or that any reservation to will be made as one at more and motorials are availimprovements which will not order a financial berden for the tax Scale to the fact that management manufaction will be someone else's ing the immediate postwier nervol in the evention industry and the many as a whole will be reaking we shall be able to give exployment to

tract will prove to be minimum; they done will be weeth greater, for they have definite plans to make the sirport a cresc center with well remarked reces. ational facilities that will not only reporte their can engine be with also attract engineers to the frior activities. Gelf Oli Corp., which regwofere and oil, anticipates that raws. the cales will referentially exceed 500,000 gal yearly well before expersone date of the accountry Richard K. Berners, veteran fixed have surraine who trained 2 900 Vessel Aviation Coders at Colerate University has been named consul manners. the asport. Part of the activities on which he is already working concern establishment of an agreementical col-

legs to embrace all chance of suistion To Hore Aere College "It is wer intention to make that school much more than a flying school is etg mand sense," he declares. "The course of instruction will agginizate the rapidly changing developments in system, and may with respect to presser speed, but also the manifeld new designs which will shootly be country out of manufacturers, accessing laboratories. The carriculum will in-

have and theire citch operations have ever, for it is expected that scheduled strings operations will be conducted from the field. One reason string, for Genreis Field prigitates in Wort bester County. Thus, it is expected that at least some achedors can be ice taking the remainder to and from LaGuardia and luter, lifewild are Additional reportunities for out-

viden) enterprise-and additional emcharacter will be applied as for Month to world any monopoly on sircral sales and service, flight training Charter or coreal services, or other the ing activities. As a matter of fact impossible so lone as the redition tempe of the area recentles favorable to everpetition. And that competition will in all probability, he consumed on a both standard come the course of the final word on reference of sale concesionation, and of other open Although Westrhester Course a eniges in its very high per res wealth and location man the man market backles recorded by New York be applied with little or no modulers or in any signific metropolitan area-man or Pittsbergh (Dicago St. Louis Von Practice, or other each circumous with restore to seem that conce-and

Even for swaller cities or good sized

town, fixed base operators, chambers

reject well explore the secretaficies of

siredar tis upo, for there is every und-

of envergence, or other river remark

many highly trained specialists upon their ceture from military service." estion the enter oil companies are present occasionic adjustments the supers corporation officials are raine then ecodomically interested in and language to be built by North Asserted August Corp. ... Other Sociéties will beam computing mire and mories, plants of its femaled backing of Golf Or Gays ... on part of manager maked and Sight school operations designed to make allowed a of restrict recently staned for Westshold County Argent. entriending over contex including one-Bying recombined facilities





Williams it is . . . a low-prized belimper that moves at a finer's such . . . a sleek, swank skyliner purring through the night . . . or any one of a score of other ships for tomorrow's sky . . . there is a Timbon Bearing to give it lighter weight, connectors, maximum radial and threat load-carrying carecity. The Timbun Roller Bearing Aircraft Series have these all-impor-

may already mudicion, as well as assured amouthness of operation, Our engineers will be glad to make specific recommendations. The Timken Roller Bearing Company, Conson 6, Ohio.

Shows at right are two of the Timber Rossmay de-rageed especially for accords applications. Top, double-row propolier blade-fundaming bearing, before typical heals weakt — heavy intentity — accord bearing.

ion that the brade mark THEFT Is no secure bearing you see!"

andreaded over Earner, a serie and luxbers military development or force officials of all nations on constitue of the reportuition of de-bombing. This development was te Justers Ju-67 Stoka dire-booder. and severed made formidable arrival our delever. Another Tealors outary aircraft which has grized onemake ettention is the high per susce le-55 twip-enriped average manus bouches Buch of these sincests has been equipped with Juniors Juno mhen hydradically operated conturn Although Junkors aircians and enone design and production had been sample beloco 1936, it was not said. lation models of a Juniors designed sandable propeller appeared. Proour designed operculable and office in Consesser. A consest assessment and that a londer's flavor 004 one not time was below used in the their set exceeded believe to be the be advances in device developmen Stanford non-controllable Junkers

reacces to Revis

HE AMERAPT MANEYACTIVATION NAM of Jankers Plagreng-end-Motocenwerke A. G., of Dunna sea, has for many years favored swinting. Justices transports were the used by the Lubbacon sirling

Design Progress On Junkers Hydraulic Propeller

By JOHN D. WAUGH, Projette Str., Custo Weight Corp. Engineering details revealing construction and operation of airscrew widely used by Laffworle, showless evalution on to find stone

propellers and fencared dural or magregisters was being in a near-niere buds in the beh socket. These peopeliers were adjustable on the errored, and in eddition to datal and comparison

better engine cooling with the ground-nifratable propolier, blade onlis were word to determine the blade shape root desirable for antufactory cooling then blades with the selected shank form were made and put soon mo. Fig. 1

Fig. 2. Justine propeller installation in Do.217 with Balle. cation (Spo) and on form (III marine in Soft (Austral)



sendore range, derited fire proposition without Saving, and solid fire proposition STIATION, April, 2845



AVIATION, APR D

vetreliable propeller conveted of a ringle-porce bub having ranguerabon or constrained second Market. Blade actions by an eil-operated punc motor attached on the forms of the dah and marced to Benige Changes By 1940 British authorities had made a thorough investigation of a

to a fundament strain of the cooling offers

of fored blades over non-dared types.

As originally designed the Inches

conduction model Tenhan which had Their spedy desciosed that the Germans had about made covered design changes receible doe to operational temands or adments. Further rearing had been added to raise the gran redacbeen tot on the blades to return the twisting moment to low pitch. Because assume a stop of a 1941 model had been made which correlately alternot been so considerly embellished with reodels having minor modifications indirected that the Germana either were

lem are still largely confeed to fu-67. Je-88, Je-188, and Dornier 217 beeshere while the VDM electrically open ated assessible rentimen in he lastylled on the rest of the Lairenfle's free Several conditions contribute to this here mentioned aircraft except the to which the funkers propeller is used cularly adapted, while the VDM is daptable to any engine. Also the VDM has had a reach lower service ed before 1935. Fig. 2 shows two invaliations of the lurkum aspectics

really striving for interovement of

one on a radial eneme. the other on an in-line power plant. Propeller Operation Fig. 3 shows operation and construction of the 1945 model: a bose decode tion will coast the features of the 1941 made in three years. Power for pitch charge is obtained to the propeller through a rotating

loigs in the propeller shaft. Cored one

from an engine driver enverour leconsensing a super-present oil name. Od here from the governor, which is and then establish a moving great train to the propeller blades A drive shaft solvers through one of the motor genry and catendary out ferred with a small spar year which suches with a large gear to provide a 2-to-1 reduction at this poles. The large year is fixed to a shall which extends through the other motor was: emerging at the rear end of the motor becover with a send gear which member with the internal own year tenth of the association size perseeth which engage our of the erars on each of three intermediate transverse

reges, through the putch lock assembly

ed to the trees of the bub. Oil pres-

core of approximately 150 are as di-

the all season, depending upon which

of order pressure passing through the

A second belies over on each of there shalts meshes with the final drive where years menhing describe with adverse. The senter, to blade suderties ratio then observed in 1.548:1. A comround were great reduction system such as these to mechanically were inefficient, experially far a covariler. The Germana assuremely realized this as will be shown by subsequent descripnon of a later improved model In the helicor center of the accorder heb, a much lock, (K) in Far. 3 is femed. This pitch both concests of a cored magnesium custing lacorporating a relief value. The alcove in portment so that a reline shaft ownered to one blade adapter causes the sleeve to be rounted when the blade angles are

cornery with the blets and low sixth

hadrenly rearrant is connected to the threetle in such a manner that sudden are in law nich would came cour-Seg. Thus, in operation, when the throate is closed and the blades rotate to a predetermined degree of so that low cotch oil pressure is by-

sediment blade single to shook o low pitch positive stope sates of war

a spidon basis of power there will be

Severeer Operation The lenkers bedraedic green shown in Fig. 4 provides the of you the propeller. It consists energyleas oil pump, distributor value with seintle and ball firmeints, sal soledie leading seeing. The solespring is loaded directly by a scion

control for flight mostlines such takeoff and orginizer, and it is low automatically by Belage from t engine through through a different rement engagement earlings below to erther. The base, which is behad in neller. The sel names section last show yors, one of which is driven by an ide year in a housing extension for the carine drive to the excessor. Our six. ion of the pear pemp carries a me

direction discriberion of nich chape cil. The lower and of the selector rate The upper end of the spiedle fits for in loading spring homed in the top care Contained in the ton coating a fit differential pearing that links the

control in the rack which removes at the selector valve spinds before spring Quite elaborate for a sour prized of convetic cours, a dasher. age, and roll spring. The two lensts for theretic and esterne control at via different year trains to that the lirelegior control lever may be correct to over-ride the throttle setting. When the throttle lever is moved, its shell consten a case linked to the shad by a torrion spring. Attached to the canis a place fifting a duringer stages! with the housing. That no realist

how fast the threetic lever o sured the damping action of the darkest de-

laws the fixed proportions of more

speed increase. When the shoot closed and the spring steed down causes operating oil pressure to do Over this assembly is fitted the sale

Made adopter forming con-In operation, oil enters the inter-side awarder passages around the refector valve spradle sleeve. Under this confittion, oil pressure awards value drees. tion to flow to the propeller, or if the governor is in nessent, or "on speed" ed so the ledet ride of the perra. The ball bearing type flyweights fitted imade the rose, shaped and of the selector valve apende more outward

Therefore 'If engine speed increases to

the point that the halls seek against

the sides of the case pass agorat

Fig. 3. Cuteway of Justice property (A) shows bull threat and rather forms

and uniformed afted most in management

posts; (C) goor wheel keped to shall

maker pinters (D) drives wheat converts

Green's Anther plaint (\$7) makes hadfre poses specificating stop your will

Confined wheat when countries they good will

refer (6) measuring year from more

(HI) formed about body (1) annual

With free moveted assuring face

(A) one and splend their der

main briefs orientary (7) radial

inferred facts on main dentity

which, is down, is upliced interceptly to

common delivery annulus will be directed to the high much sade of the



Fig. 5. Exploded view of cit mater and pase tests of 1943 model during according speed condition which is desired. The bollow both center to made nonwhile by dispensing with the usual

soliced propeller shalt. Heb attachspecial is therefore accomplished by than the effect of the firmwights and the valve will drop to encover the low Hirth-type serrations on the year face pitch passage to the propeller. The oil pressure generated by the seems is apof the hub, these serrations mating with similar seeth on the flames face of proximately 170 pol, and there is a the craries that. Eight stude in the sate of flow of about 11 gal, per min. hab rear face project through the engine florage and retuse the hub. A large exceletic rubber sealor rue is filled between the year high face and mohtbdenus steel foreign, the Indices both is cadminen plated. Bell-mouthed the but, which is bashed internally blade anciety was negocial at their with cel at a slight positve promuce. outer internal lies, with hoursess through be front face of the but has a flance receive the blade retaining put to receive the pearing appropriate out rhired in the base of such blade ions each of the both sockets so that socket is a benefite revers for the laner

Correrally, if engine speed drops,

icernal bearing of the main blade

with the hone of each blade narior are

the projections which engage blocks

fixed to the blade butt, thereby liest-

ing the low sint blade seats. A hole

bared through the base of one blade

seelert alleger a mon't colleged shadt as

engage the butt of one blade and the

constable valve sleeve of the nitch look

which is bound in the bottom senter

tor. Also muchined integrally

the drive worms will contact the blade adapters. Fabricated from Heine, process compressed beechwood, the blade is acresof you a tracered steel adveter. Don disk spreng into the adapter. Inner blade adapter, which is a speel shell

incorporating were teeth on its laner

base of the blade arefest and over an ex- a broage traces and recented in the Nade adsocur. The threat bearing is composed of browns capaci roller bearing accine against the advecer bearing leder. The contributed bands or saint by these base presinter and which acres into the blade socker, forming the centrr three searing race. Just above the three bearing, a bearing surface around the reads blade adapter, and lowe rolls: to the retaining not, force the open journal bearing. Both bearing parlson brear lie of the main blade sisper which is wedged between the min

rim, an integral bearing ledge for the

cow of ball hoursers beld to race.

which fit trep the bearing rocess to the

journal bearing consists of a double find into a solid expression allow

other is weight between the county the latter from superwelay and the blade because detached. This comrecurs the too of the blade adopter to as the inner adapter threads are reof of heading bands. Threads on married of the main adveter receive ultr to coetate the locking rior which implayes on the broner adapone. The constructed a block and, in held to the rice out by boles aved oil scale in the rise of the reor was neveron oil lenkner. Power Vall

Emme on the frant of the bub, the er anis comists of an oil ractor an relation genring and a worm our train to the Mades. The oil money dusty trothed genry endoord to an assisum alloy housing. Apparerely els a proportion drive than some teeth adte allow a slight oil seepage which americanes. Roller bearings support

when does the city many on their book Take mak was fitted to a 1,200-bp Junkers have 211 copies in a local serval source teeth drivers a shaft win-engine bomber. It is a threeted with a swall spor year which sedes with a larger goar. This large per in keyed to a shaft extending neart the other (hollow) money te motor equipped with a anull spor esc. An extension of the rear of the name with the motor drive steer coar in saferral belies teeth to drive the his tourchasting ring genr, countractel el two pieces riveted together, is The screen ever reduction system is

using with bell bearings, while the nation and continued with roller hearhas for radial loads and ball threat learness for the threat loads improped tion retating the blades. The estire winction assembly is fitted beto the the the foul drive woron engage the were teeth on the rim of the main link adverger. The money assembly in over the gearing and is held to place by reteining bolts. A magnesions from shell fee over the entire power and is sealed to respect oil leak.

non frished all over. First stage

of three warry shafts is assistant with

The recognition which we are concern. of with here was apparently constructet in real by Junious and a subcontune whose markings were not iden-

tiet. Four principal design chaoges was seend; The entire oil mater and te pour reduction assembly were AVIATION, April 2005 STIATION, April 2006



more throughout that are bound altered, and the blade assemble and shows the motor and near train evaluagovernor had undergone modification. ed and the parts in relative position to

by belts. The motor housing is bolted ft. en dus contened with wooden to the staids of this dome, whole the blades. In external appearance this main entaction granter is fixed to the model appears to be almost identical but. The oil motor brealest is labelwith the previous design. Only the shape of the oil-motor does has been cated in two pieces of your cost income change of the divinesty mess for their aleminent alloy boother which was approximately half as heavy. The oil madden the outline of a German untilseredy takes across directly late the ier's belenet. Close examination indiyear of the housier and are led to the motive genra by cast-in passages. has been increased and a new tyre The hearing course which also note front has been applied to the high in position by two dowels and secured gone the most accepted redesire of any consecut. The oil motor stack, been retained in principal, although straight aper teeth are now used larged of the belief two Som once on the front of the motor are still race to provide an initial reduction, are

the both. This regurable slower year

Construction features of the names

by through bolts. The motor genra are supported on each end by roller bearings and are equipped with roller pears to the year of the motor hospine From this point to the blades, an epreefly may train has been interconed not the foreser worm over year tern. Drive genr at mar of the motor of a ring year belted to a care curry ing three planet plotons. These planets and the other a shore may free to rotate relatively to the fixed goar and

throat bearings command in a rece servitor to a washer. Both grove are Descent Weight Increases One year, threigh, in hollow, which vious model. This bollow year has for resonan and clear except resultite. to the Germans. The effort to reduce melabe by this small item mints be lightness. As it is, a 1-th solid steel shall have been need to 40 on a browning genr drive prompy, although the ping

festuring an oil draw plug fits over the

entire assembly and is beld to the bub

tice does not seem reasonable. Exactly how the one motor near in made builton has lowe been a courterversal maner. The inside diameter of the believe year is so much greater interval shalt that a countinged exthe interior was muchined. Honever, dome removed. One blade main adapcates that the year could have here ter is installed in the hab socket and a centrifugally cart by a highly antiform process. Tree if the man down to terweight is fenced with a stub blade. value of the result is marriagable. The oil rector shows at the freez our of Pw. 7 has a 21 of speed review the suctor provides sertial speed reduction in its severies of estational motion row of loose roller bearings. The same pinion A. having twelve treth. Pinion year which is drives by the motor A drives ring genr D which has G involute toods. Mounted on a pinion shaft deliket around its own with lightening at the prevalence of E is elegat year a boles. This rong great is notached to of eleven secth. Planet C methes with the educat case by any bolts. The educat the fixed run pear D of 39 teeth and eage is a solid absorption allow markin. manable can gray E having 42 touth tor of stock section. Planet gram are

panding tool would have to be sent it

for the blade drive gran which fits over

First drive to the blade is made excepted in spectures railed in the through bevel gear P, integral with periphery of the care on hollow also peer E and eguipped with 36 teeth which much directly with the blade served into the cage walls Three rows of loose relier bearings man C of 40 touth run on the shaft and in the planet and Hob Deelge Sterter they are reparated by small assesses I've steel bearing races are present and noted in the following calculation. the greatest speed reduction occurs at cage to the cage may rotate on bone color bearing basis for their leave the can years D and E which have a and the outside of the blade drive your differential of three teeth, easilier over The fixed sen geer is dowled to the E to count 3/42 of a revolution for hab and has two ground, hardened serfaces providing owner bearing races Thus, 27 × 22 × 27 × 22 = 422:1.

the reduction ratio from the sill motor bats. Loose roller bearings are included in this final drive as well as a flat The both remains countrielly the threat bearing washer containing small serie as in the original model, excess that the eitch lock in the bollow con-All steel parts in this power unit assemby have been treated with a black hole in the base of one sucket is not chemical strain having good penetrating quality. Dural parts have been une has been randfied to receive the automated. Freinh of all parts or fored our year and blude drive year not highly refined and the fee of seaso Lightening holes have been drilled and bearing surfaces are not very shop.

blade socket, possible stape bere been greeting has fair abrasine resistance left innerval with the beb and breez Siding qualities have to provide a liner for the -de letter figid distribution but her made, such equipment mer readly to attached. Spinner disphrages recently is achieved by rine stress below mand the ren of each last union The strain incorporate a thick man section containing holes to receive to appear, characted to fit over the postphrages retaining bolts. The dissipant has a shring ring which typifes the German quele-detechable spinner as n g the feathered and low pitch posttreshwed by VDM. In contrast to the VDM propeller which has holes deller a start had been fitted with halls in new directly into the hab socket walls of

cervity the naipper, no below of an

tors are deilled in the Junkery but

If de-icing is dealered, a purkey fung-

come leaking rest. The interior and exterior of the hab has been trend to thrust bearing still consists of with a black chemical state and the siler bearings in a bronce eage riding exterior has been control with dark against an integral bearing lodge on erreen pales. Blade Construction Verter Redesion is also evident in the blade. so; for construction of the later mir The becare blade adapter locking differs from that of the neering motel Compressed wood in only used in the planty and man adjuster by a see short perties which arrows was the blade adapter. The countressed wood shauk is applied to the blade proper by innered laminations. The runs of the blade is correspond of approximate of wood glass together by a pak cement. There is no emission's of strain or supremented of smalls for

canional banks are moved Possibly this use of all grades of wood is due to a conservative policy strenging from a lack of case-raines lack also indicated by the use of our quiety wood insupated and glast to nurber to form the stock of the stock and German Master rifle The whole surface of the blafe h covered with a course men take mesh copper grape of which a less leaving when about is smooted for cros for the leading even shouth for blade is totally covered with a relie loos scotate about about our their ancied to the Made under recent

recution to by a pinion regated by a refer wheel A rable from the govmist consiste the marrier Do sol course it to rotate when the toutred a moved. A positive stop and adjustten are provided in the control head before the wer, has proved to be a to secure limits of operation. The oil

helt, and it is noted that some of these party artisfactory treatment for the boins have been filled to achieve helt another blades Europe for a few specinote. In machining the base of fire and ment blades have shown that the ad good affering and montare ex-The Marks supergraps commerce has one percent a few modifications but has sound benically the same in design. te has been described, a benel sear Outs derve suppliants the former warm pive. This charge has necessitated tool peoples on the polic blade of sales which extends arroad helf the lower ster of the adapter. Barrow of the use steel up the neglect. In detect with almostable phage for pitch adjustment and with roller bearings as a care

> to advoter and project the adapter, or Main established and A Armel of the mast one is tightered against the blade which severe into the counterweight mr. The constructed one for the finds on the outer lip of the rade. planter. The construentable beauty has

for it has been enkeleded that the winter recently created by the weight emins the contributed by the security drives by an extremediate pear direct test of the Made apparets to 40 year. from the engine manufact and has not THE OF THE COMPANIES AND ASSESSED. Saweights and one-bottomed distribthe side degree markings spaced - the hab so that blade sayle sonince. way be expite determined. The B is an the many adapter apended The constant speed governor has box martifled by a sirestification of the owed head and the addition of a inflating payer, meter, and valves were county valve carrier by a perior of converbe greats frees the control burn has been applicated by a simple

However, on additional bussies has been added to enclose two belically testhed feethering oil come more eatly operated by a reversible Rosch. electric meter centrolled by the pilot when such action is desired. Acres reatic valves in the bousing direct the feathering oil to the propeller and corder the country's mont posters becorntive when they come into play, Seclarion of a feathering reason in the in a complicated, balky guyymov unit

The Junkers propeller is beavy, wrighter assessmently 625 h. and it



Fro. 8. Exploded view of blade retestion components.

certed at inverserance. White the sear enar reduction of the latter model is They become at the 1900s, ander or mpe of the blade counterweights has bern increased to make up for lack of blade angle charging power. carine control bearens the conseller probably renders reasonably good and in the mechanism, but the loose bearing feature throughout is most likely the whole unit, with the possible exreption of the main adapter, is such a

does not show the menerally thorough

of ten projetters, with describe dif-

ferent features, have exhibited various

and untiley experiments apparently di-

title. And since no part appears dif-

Fig. 7, Schemete diewing of all motor and year time.

STIATION, April, 1845.

fired to expendentian appears in be barb if the armedier was desirable

Why More Than Two Engines? By CHARLES H. HURCAMP, Need of States Superhead, St. Look Field, Alephone Str., Carbonill right Corp. payload performance and operating costs are all the optimum when the sic plane is designed to incorporate the Senset number of the root sometic empires available and suitable.

This explicit power distribution energels molecules that equal safety also proster profit for the operator provinces use of a greater number of power plants. V show in the transport ar-

they will be icined by newer models of bearings of the party Among these will be the Carnes Commands. This tary service, are two-engine or fourearing craft. Signie-certine machines strplane, representing the largest twoin competitive in sice, lead-carrying management, and no simple entries airshifty, and performance with current place may in the feture be licemed four engine designs. in the transport category. Select appropriate with the initial Marrager, the triggerore, our design of the Commando protestype, a popular about 15 vr. ago, has dissepercent from the scene. This time was corine true was made. At that firm engines in the 1,500- and 2000-ber more unconductable for both over and category were in the early desire. energers because of the noise, vibratransports designed to earry from 30 proc curing Prot vision was some to 40 more married and in the what obscured, especially with the older engines which had a habit of threwing many as four curiors of the size then available. However, in 1937, when the By far the exester weather of artiste successful development of engines in bours have been lagged by two engine code Drive to this war a few from assert. Certise Wright decided to proceed with the two-engine type. The corner transports were in use, after this war a great many more will be decision was based on conclusiavailable for extendated oversition. In which included the points that-Selete of the poster and from

the war, at least two new models desaloned during the hostilities will be lord, as in the United States, is essenextraduced to sixture our. In the tworeproduces to Drille tax. In the two 2. For a given size airplane recuirwe today will be doubt continue to one a certain total horsenesser. the

fig. 1. Comparison of two, and transmissionards arctics of in mph, of 62 percent of some field power of 15,000 for

addition to the type operated before

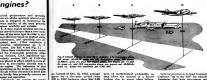
clase of the same type in order to have equal efficiency based on payload ratio. neederstance and operation out on payload werk. (This conducting the per-payload werk. (This conduction is comparbat substantiated by Z. 2. Namer See Bet 4 and No. 2) Since these constantions were reached and the Commando prototype dodgs was restisted, CAA legislatus-pabeen placed in effect which is were atfrom envise. The influences of they aircraft will be discussed in detail late. enoine out operation. Obviously, the greater the reader

carrier service were due to power plant larious affect the dealers. It is unuseded because to more that for an intersuchate size of sirplane intended for sivine operation in full comolumo with existing CAA regulation and designed for a given load escucity, a recommendate is excelled unferthe bearing any and the second of the second in performance, operational economy, and "needs ability" for short and intermediate leogth trips. It will be freely admitted that for long range and over water correction, the feer-negles alrelanc is superior. Is might be argued that the relater safety of transport sireleses is multiused by the magnitude of their warries

deal primarily with "one engree out" execution recording of the number of ingines. As an abourdity, it would be ndown to assume that a twelve engine sirplane is safe presided it on get by the regulations with one-engine get, and with two, However, we are dealing only with a commercion of two vs. four. Unfortunately, since the erent realerity of airline operators has been with two-engine equipment we are mable to look over the remei Harreyer, statistics on accidents to erflectable to power plant failure then

1. According to the Clou Accoun-

A Plant continue here has smile in AVIATION, AND INC



landere due to never stars tallers.

ring during normal flight at cruising

His study was based on factories occur-

sidere. Of these, 5.23 percent ocpower. Here are his constaument carred during takendi, Ol all dossessie, "Assuring a ringle power plant to have a reliability of 500 trice nee fail-\$52 percent were der to sever plant uce, matri carine sirelanes are marre isher, and of these 762 percent octimes roore reliable than single engine men (provided they can ily on less than all their envises) are envised 2 Duran the most recest threemar servicel, according to CAA recin the fellowine express) a sets, there were 174 cover of consider (A) Forrenoine similare combine mine failure, including ten cases of maintaining a given abitude with marries desire tobard Name of these cause learnhead an accident 3. In 1942 there were 22 cases of of maintaining a given altitude with sever when fudges, more of which reone engine-240 times. (C) Four-engine sirptone espable Title cases of consists envise failure of majerateins a river affiliate with during takeoff, or one for every two engines-6,500 times." 75,000,000 mi of Spine (Ref S) A mail designed free-service also

4 The largest properties of fatel plane should be excelle of exerting sirline necidents occurring within a condition (C) and thus be 27 times as for your period between 1939 and rafe as a functionary airchara which is 1943 has been due to a combination of bed weather and faulty relating techtions; only one known core has been minimum marges over CAA requirements, it does not have to better constributed to engine, equipment, or sirfrance fedure. (Ref. 4.) dition (A) which makes the tworesine sirplane 3.7 times as safe as efficient is increased in durest support don to the number of engines. For the renow form-engine significant sir carry a fight engineer in addition is the relat and comiler. While the pilots are then referred of a great many duties, the necessity for conciliration

is care of an esseguacy is greater,

which is an addition to the Plicht

Friking (Pat 12) has debad into the

specier's responsibility.

AVIATION, Assis, 1845.

This analysis is based resisely on place could be 27 tieses as safe. engine failure during craining flight Critical CAA regulations affecting aline at 60 percent power went factore. the revaiting regimes writes at the staure root of the ratio of the revelo of engines operating before and after the fallers. Thus the newer of the rewould be 60 percent times V2. or 85

the design of aircraft in the transpor entervey deal with talend landing and enrouse operation, and may be strumurized as follows: 1. Tebreff. (a) The rate of clind with any one engine inoperative and it consider winduffing and with the other envises counties at takend cower, shall be at least .035 times the square of the stulking speed of the air

Assessed that both two-corres and

four-engine, airplanes are loaded so as

muthematically safer on the takeoff

Louis Plant engineering department

His amplacie assumes that all engineer

secrete at takend years before faders

takenff power after follows of any one

strature requiring one-engine for take-

off is sie tones se safe as the fore-

from Perkins' analysis (Ref. 2) by set-

tion count to make the factors which

express dependency of the probability

its engines on one side is at a disad-

than that of a pen-enrise machine, re-

poiring greater radder defiretion and

resulting in higher drag. It would

thus be a race case where a four-raring

A forr-comme aurelane lealer two of

of engine feiture on nones natural

He combutes that the tenueuring



could with these at takeout sentine (b) times the square of the stalling speed from which the aircraft is permitted to be energied in determined as folment not exceed 60 percent of the lows: Assuming that the takeoff run is available curryay length. (b) Stalling started at fall power and one opping count with floor set in leading count use exceed 20 mals and with floor act in the "arecoach" condition, much not takeoff, it must be coupled either to continue the flight by climbing out exceed 85 crph. The "appreach" conover a Wate observer with a windof stalling used—is defined as includrefiner propeller on the dead engine or to bring the airplane to yest within the me a the cotton which mell after the confines of the field whichever dispercent to enjoyee a case of climb retraction of the landing year is begun

with our curve innocenture, remaining engines at takeoff power, landing year retracted, and propeller of dead engine a 50-ft, height. Takeoff speed switt 3 Earneste Operation, With one be at least 120 second of comment siniling speed and 110 percent of speed for full directional control. 2. Lendon, (a) The mentioners tureous operation, the rate of climb length of airport mounts in determined from the drivance measured from a of the staffing second at an atribude of believe of 50 ft. above the avound to 1,990 ft. above the highest terrain enoccustered in the line of flight, or a naturates of 5,000 ft, above are level fr. sittinger, approach speed most be at In exceral, the two-engine transport SELL 190 recovert of staffier sevent mice is more critical for condition I (tales-

off) then for condition 2 (landing) in

report to rate of sliech Description The reserve is true of a four-variathe fact carried is more than that a redred for a flight of 1,100 mi. The the difference between allowable gross weight for takeoff and landler will be secondary greater for the four-serve symbols resident it consible to add the andles over design gross south Stalling shoot requirements usually be come more critical for four-engin- anclose there for two engles Let us your make a direct corner. on of a two-engine and a four-curies writer transport, both designed for the come execute tartage. This is considcred to be absolutely fair, since as vaccator, in channing between two and have in saind one particular tree of meration incorporation a recognition cause of trip lengths, a given manipum second of payload per trip, and a web light weight if necessary to perchase conferent which will A breakings of weath sense is operate at management economy, bring to good in Table 1 appropriate the the mass revenue, and realize the high souls. The mercuse of 1,650 ft for

The specific contents taken for conparison is the Curtist Corenagéo, éperison is the Curtus Community of selects some extra weight in not usual to carry a maximum poying of suchs, orgine muses, confine, wast commodations for 36 passengers. Alshough the Commando is designed as a few four-empty penalty means though the Commando is designed as a few four-empty airclass will not though the Committee of Screen and has be con-anguse anything we not invo-confuse transport, it would have leade to carry its full design periods been possible to design the same true on the normal range of operation. of airplane account four-regions of the making gross weight is no-be accounted that the latter arrangement and by staffing mond, the position he are med that the letter arrangement and by stalling upon, the question has been carried through the drogst stan as as what can be done to remedhas been carried movegn the come status to what one or come to resone these and that we are acknow the come for modelies. The obvious thing is to will, therefore present all the evidence of sing area, since it is assumed that It will be account that the airrive to be receiped to use meet the following waste to 48,500 ft. This will require elich can be necomplished by adding

Man, number of passengers * mm Can should the total the Street PROPERTY. pid resident ten begenrier Pidt perturbante with all CAA rerelies with owners out (b)

designed to meet or exceed these speci-fications. A four-engine version work also need these requirements, the oil-bands charm bines in the court place. Uniter four currently available engines having the name total power cetyol if " Topland on his hope, for and

Maximum landing gross weight and by the CAA "approach clied matrice for the terrespond condens though stalling speed (50 raph.) is outr so cretical. The stallars used industrie does affect the form-empire inhee, lowering the permissible white dightly day to the effect sere awelle and windrelling ore.

Manager takeoff gross weight a no sirplane is beried by the CAA word deal" condens. That of the berouges sirpline would be bissed a 15 percent over the lander would the leading gene structure were deand for landing gross marche, it is sound, bowers that the landing one streeture can be designed for a te four-engine aupliage in der primade to the newer start been but whole some extra weight in the This weight-empty penalty means Sex to landing gross weight is lim-Syntax wine leading by the addition In order to equalize poyland, it is nomery to increase the landing group

Uft to the span of the constant cheed seer oxact. Characteristics of the turesque machine will be changed a follow s 1 2 2 2 2 2 1 The wright empty figure has been memori by 215 fb. to take care of the sensed wood seen. The two regime Consumedo has been Appropriately the hose-engine

Using four currectly available engines

ATTATION, April 1948 AVEATION, April, 1946

ignered for full paydoud also that for a Table 1-Weight Small Communica 500-cm, trip. Per 3 shows a correct. mine wine I'm porarite drag area, "I", of 234. No. rette from in increased by 66 percent and total aurplane dray by 5.75 arreses Cooling drag is approximately equal as social me to power is the same. Presenting good on each matelliation are as follows:

Fig. 1 shows the superior equipme speed performance of the two-coming surplane. This is due only to drag fachave some the creation mover to count resume speed is placed against gross winglet, so that allowance can be made for the fact that the four-review aleplume operates at a higher takendi Fig. 2 shows the nitport nurvey least repaired to meet CAA "one curac our operators Here, the fourregime amplitud about up advertigofool, but the foor-engine alephane never cently for operation cut of axaller couches on management allowable tuburell facility, shop to the fact that of lones code percess of its power against

30 percent of that of the two-confine The later, bowerds, or within the specified length, requiring only 5.100 it at see level when taking off at rextress gross weight. Full power saleoff distance in lower for the reacycline place because of its lower gross wright, takerd name being send For this comported the gress weight of the four-cropps sireland to

con of "operational origing" according to the eference ward CAA menica ruces for encount operation. Assessment four-engine agridant is numerical to the single engine cedent of the two-resine serplane. The latter, however, it repetitive to the two-engine celling of the feet engine machine, according tonengines out on one side. For an economic comparison, the ATA pathod of computing direct operation cast has been used, the ash ex-

epites being this effect of possible For 4 shows a compension of new had stated spring trip learns. Mariname purioud capacity of each nipplane o dest under \$50 trees (11 000 th.) This is based on 36 passengers, baggage, and all available cargo compare sects loaded to a density of 2 is for the The rank and four-engine airelane can each carry this fall pealend, the former to a trip length of 250 mi, the latter to From 250 ms, and on us, the two regime plane west sacrifice parload for

weight with full profess up to 1,000 set. This messages that the heading year structure is designed for landing gross weight, Scatting the takend groun weight to 15 percent additional. If the four-engine alephane were not restricted to this manner and allered to consider as \$7 and the group wearbs, is would be able to enery its full payload on trops up to 1.575 mi. Direct operating costs per too saile are compared in Fig. 5. Here the trees. engine coals operates at a lower cost



up to 530 mi., where it becomes examiton mole - Direct Sping cost per tenmile) - Airplane Cost comparisons has been recently deval-The gross profit comparison is illustrated in Fig. 6, which shows that the port analysis section of the Corrier-Wright St. Louis Plant, engineering two-engine simplese pays higher re-He reports that "it has been senarres foor-engine at trip lengths of less thus the reports that is not been apparent 500 rsi. According to a courte analysis tory base of comparison for transport tim-Wright department of business peaircraft. A precise economic consusticearch, taking Seco. 1940 as a regical son would involve the set profit before

accepted for comparative surrough

prewar morthly period, route segments or "trips" of 500 ms and under repre-sented 84.7 percent of all passengertaxes per sirplane hour per dellar bavested in the aircraft, which can be riles flown by 14 major sixtings in United States. These fageres were de-Tom-Miles per hour # (Revenue per tried from the CAN Station on Station ton-mile - Total operating cost per Servey of Seas, 1940. mile) + Airplane Cost Blate of these sirlings had no route

The total operating costs of an airprevents as low as 500 mi. Greating the probability that there will be an exsince are generally broken down ices crease of long range hope in the postwar seried to in belleved that there will be a correspondingly greater ineverage domestic airline con operate Although the ATA method of commore economically, bring in the most revenue, and realize the greatest profit

there is issufficient data available at ragine equipment rather than four on this store of air transport Asselvement modern cance Sinkle to be able to draw special constantes on how the different types of erecraft affect the burden costs. However, it is those will not carry a flight engineer fairly well established that agy veriaat an extra crew member, although it tion in burden costs favor the twois a widely-bald entiring that this engine nirplane, i.e., the two-engine alegraft will have lower indicact flying of trio length or type of aperatum becosts due to reduced spares, lower coor came of the added complexity of power ground facilities, etc. while there is no reason to believe that G & A and T & A place adjunctions and instrument and our. If a flight envisory were included costs per toe-sails would vary due to the economic aspect of the four-marks sireless would be adversely affected It is therefore believed conservation

to compare the two- with the loarextra crew mereler sugine sirplene on the basis of gross Certainly so one will argue the fact profe frees direct flying operations per nirelane hour pay dollar invested in the

that the two-engine neplace is a skupler proposition from a mechanical Fig. 5. Comparison of gross profits of few and four-engine craft in States of 50 to 1,000 at four-engine coult in flights up to 1,000 ml.

Tow-miles per hour x (Revenue per lass serving: Here again the maparties has invered the four-rate sirplane to that no carra exares by seaboris decume & represents to the two-segme surplane pays region of interest cost one ween Kine to meet perfect eather than the gross peak A stand item unfavorable to the feengine surplane, for which no me rical penalty has been enaced, is for probable increase of time or o ersend between fights. Engine and engine accessories are responsible to an approciable part of delers du s mechanical reasons, which is turn on resent a fair percentage of the and

time lost on the remed. Although there are an inface con ber of possible variations in the & sire of both two and formation transacts, the feregoing extraple on lieved to be replicable to the inne. diste section period. As to the fetus. believe that nicolucus will be increase If this is so, there is will said

reason to believe that engines will also ere appealer for long cames and see worse have it is firmly believed for continue to be, the best but for the in new rine we to that established b economical are of the most recently envises assistable

A do Now Many Support

AVIATION, April 300

mal practical belicosters in

fire Swim watch America there have been many It is but a little over three wars. elerned expects, concerning the perbrauer of retary wing averalt, PORT and technical inservate until my readers have been left bewil- the Kitty Hawk flutte. Unpresentiabilities, lark of stabilities sail weight-carrying expacition, and der top speeds are some of the

membed because its present state of

STIATION, AND ING

durges leveled against present-day mer wing craft, frequently by those femiliar with design problems inwhich in the development of a natiowhere vertical flight marbine. These when the partially true, but the similar problems, structurally, to those

since leng Schonder successfully demunstrated the VS-300, and much nearrest has resulted-a favorable comaircraft during the three years after And we can expect a more rapid comparison of a rate and acceptains? certical-flight craft, since reach of the a create at the efforts of designers and engineers of fixed and rotary wine town to mits of other security was Besign Gompromises of transplance shaffour and research enrine hyations, believaters arreses

hier structure is resulted with one-

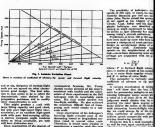
report gain in efficiency through more central evention of communect weights and with elbolration or reduction of high tud-loads as exist on the frozen, wine type Accodynamically, a more perfectly treatdated fastings is permitted by efinization of need for fairless of wings and tall surfaces; by reduction of size and inchessells maked at ther year consequents; and he was ni buried nower plants. Here, then the designer has a better chance to profess construction that is efficient both structurally and aerodynamically

Accept designs the Mathematic belicopter not excessed are common mines between factors which determine the characteristics of the marking



Bull bullcopier sees here utilizes enventable derive declared to effect another stability. perfection is not extend to that of a





uncontrollability and lack of statisfer,

t seems that the first thing is to double

rast what account of control we need

in our craft. The problem of achieve-

ment of static and dynamic atthicky in

forward Sight is similar to that of the airplane, and is comparatively carr to

arrive by the one of small aggillary

The best bovering stability would

erm to be when the muchine can be

form hands off, if necessary, but with

perfect controllability when moded. icese type of gyroscopic device—a

open of the antomore wifer

rerison, hence will not be considered

where: P = forward flight veloce: con a -- cooling of angle of tilt, assum and R in radies of cotor blade. This parameter is variously called coefficient of advance or tip and A cursory examination of exists date ! will show that the best !!

ercaving the retor blade angular rebuilte applies the restruct the bloke ity, we could always fly at the or more coefficient of observe and o achieve speeds comparable with are However, this is a rash assumption as will be seen upon coenderstonmanufacture a marking with this type effective rosay blade tip speeds and t of device, capable of the required staeffect of compressibility. The six Miles and menter Tablita for refere Weight-carrying sapacity is a deand the forward-flight velocity of fe to sell the need of the mer. At prescrait, and a Mach sampler (III the 6,000-th group prints class and

using an engine of about 450 ho., in exceeded. shout 1,500 fb. This is a development of about 70 servers of the efficiency of of about 200 raph, on helicopten of the type new flying. Considering fit. an equivalent airplane. how can we avoid compressibility 6 Although as in possible to increase dentity and produce a responsible of economical high-speed craft! engine bornesower and outer diese First, let us consider the prob eter to obtain as large a lifting casesof engine failure in flight. This or deing, with the impossibility of a se landing, was one of the serious but

perhaps, or the task was atabiliaseto control the cardle estable of the second ity us desired, the averall efficiency its byreeing with hands off place a of the realt will ruffer. However, for exick release mechanism for instan city delivery service and above heads, controllability, might be the soletion this sacrifice might be universelved for this problem. A gyroscopic devica same this type of helicopter might be has been used by Arthur Young or reserved with the modern seator Bell Aircraft in his heliconter Goller truck. Here we use a low becambles. and he reports excellent results. orgine and sacrifice sapid accelera-tion to obtain vehicles which are more At the Jan, 1944 rotary wing air-

septist in not too great, and the disk heatedly discussed our and one and te designed for safe entreotunes takings. Then, in case of engine time tales Verse raised the annual of air speed in the Chapter of an adars, it is possible to return to the Clouds. Capt. Robur and his page round safety. These factors, lawplantic believpter was described a our, officer automatically lavel the deraining as much excitement in below army to hope, rather combecourse out circles as Seor Silversky has own user, or receire him to deure what sweep today's siccraft enthusiases night he an unnafe craft in order to Predictions of from 100 to 600 min. altieve compostness of designs. have been made by some who have a To avoid the great up speeds at narrow a viewwyst of same particula vist forward-fight velocities, and derive or perodynamic phase of an sekward size reters, it is necessary tary-wing craft. Extremely her to dak leadings, and increase the anmot, -- have been claimed by some visit plar velocity of the blades. In arrive perhaps are acquained with the pr actions safe leading characterison with this type of room, an espe-

warn lemme, the peach angle or angle

tally reliable type of soner plant to unded where two or repre equipmen us connected to the cutor through time engines failed, the others would andless to operate and permit a sale sorrest the dead regimes from continue This design arrangement is by no cents new or revolutionary, since it ratio for westernaday sestoring or any was used in World War I by the Goverotating beliegoer rotors occurs will ness in several of their large homburs. the Lockbeet's United installation discrend years ago, in which two corion drove a timple property through starius, proved a penetical dushra. As the present time arrayal foreign alr-

No. 2. Helicopyre Seest Weight and Harapewer Braines . . . Swe Reager aroust an given, SGV-7708-7, 458 bp. et 2,000 Hernestween-total, server Das beeling, Bringth. Craiding speed, 75 percent navar

total of allert . Reage 600 mi Bedien. Number of Mades Total blade eras

450 R/ww

500 ft/see

of advance, tip speed, and forward fight velocity (NACA Technical Memorandow No. 960*). It can be sees that by reducing the GD useed and using a higher coefficient of adcopper, the marries of arbeition invance a higher forward speed can be mediately arises from that experience with cuttery wing craft. Engine and Therefore, to decrease the tin speed st would seem that the reduction of the rotar augular relocity in flight would he the desirable these to do done varying the retor Nedo length his flight, while possible, does me appear

craft engines, includior both the

Namer Sabre and the Jurious Jucas.

employ practically the equivalent of

Fig. 1 shows variation of caedicless

and proper genring. this can be done withour under deliculty, and it might even be assisted to incorporate this feature in the make rotor transcription reduction genring in a similar marner A method celeta whereby it winter seared at the repor binds tip. The outer

crangulation unbalance ment be beld. balance is temporable to obtain. Theremarking went occur shows the westcome flying speed. To active this is practical at present By ming a clatch a matter of atificality the structure as Accordenged vibrations caused by the retor and ground resonance are rraft. With a smarle lifting stars is in Decessary to eliminate the colline wement changed by the unresult felt rater. low between the advancant and recountrag blades. This is done generally in effect of two ways-by articulating

could have a Mode section of the sup-

respect to no michous contas loss of all

figures at loss secrets or however.

taxael investigation, and the results

Vibraties Effects

This is a renter for high-spent wind



Heradag * CAS enformers are related as and of the ATLATION, And 30 HIATION, And 1044

boos of carty designers. The public

second to be solved when the arms

was invested, and it was proven it

etorotation was possible under in

take design conditions of the mil

Provided that the solidity is all

Tep Sweet

Playeing and feathering can be proves to be acondenamenable sensinowcost, the fingers blade with an energed lift per blade during retainer cannes an undescrible vertical varia tion at the root of the blade in the firms per blade. This variation causes an exciting force which gives on tremely had eibration in a vertical derection. Since this vibration is caused by the finguing action of the blades which increases with forward speed, it come anomiercable and even areason negation at compressioning the fee

the blades and letting there flap to

cotation, or by feathering them cyclisty

" a siremoidal manner, to sive rocal

There dangers angles can be own traded by including a cocked delta binge at the root of the blade, which casper a decreased night acarle with increased flapping angle. This, however, is similar in action to partially icathering the blade; therefore, who not use a fewforring cotor in the first piner? This type of reser with equal th around the disk does not present your rotte at higher speeds; further it oliminates intered sits of the many This wiets climinate appear chearance problems in Assists. Also shainted in

the possibility of the mater certain our of sten Ohe Mades having unequal angles between them) in the event that one wheel should strike the ground before the other as exists with the Ground resonance on this is named on made more than one craft ex records appropriately and in several demonstrations has created an unforby of retary-wing aircraft. These viof rotor arrangements, but the older

broads or fore-and-aft courses rotat or craft have an additional another In a marger similar to that of rushi of the propolers—or rotors in this case is difficult to achieve and hand or maintain without pearing Methods of Plate

we would to be an economical as nonable and utilize becomes in the word efficient manner. The extension for a fine accordanged fundamentarion is well established and applies comelly to high spend beliespeers and to foodwing sirersft. Landleg genr way be retractable and air intakes well faired

three methods of flight or strikedes by be the case I A ! Managed W

entely, as the forward speed successes. as with the suppriers the Mades arrain operate at applies of attack which are not best for good efficiency. Nature above exacts a price for that which New look at the belacogyro. The rente potent and in meeting and the blades occurs in a stone armoustuntely parallel to the arraream. Here be superior to either of the other rocthods, which, indeed, has proven to

means of which concernies reals

warf-driving procedure no popular ma-

forward in the direction of flashs on

forward-driving property, sower than

plied to make retor or retorn.

(1) Autorsto-Roser axes titled rearward to the direction of flight, [or-

(2) Helicopter-Botte axes trited

(3) Helicogyro or Helicogyre' **

Rotor ages vertical, forward driving

peller. This type can fix in the more

masser as either of those mentioned

in (1) and (2). Now in which of these attitudes in

a move roost efficient? Let us set up

vantages for the persons of a birty. manages see one purpose of a orga-

that the votor is an actuator disk which

passes a certain amones of arr at a

certain velocity for a given thrust, the

want the rate of flow through the fini-

The rate of flow is dependent soon the

from ower the pirital reast efficient in

blade section operate at a good L/D

the medical tens in taxable

words coupled to additional dear

speed assegies flight, it is seen that a

this year, which gather it unsurfalir

for obtaining high efficiencies. The

backward oft and recovered from also

cause the airful sections to set in a

variable-direction stritream and con-

At first glorce the forward-tilt-sais

hollopper would nove to be south

more efficient, because, for practically

the same amount of power as for boy-

ering, a slight 68s affords a large for-

went throat commonest

other large agently is ignaced about

amount of power required will depend

Ifeforn. cooling. Also, it waste be combined

to date are of the buried type, and it ugire a blower for cooling, it relate? practical to obtain 30-35 percent no revview the cooling isn and engine noise concerning blower cosing alorredt engines", corres are El which show the possibility of beauty ing aircraft performance up to 30 pe east by the reduction of engage of ing loopes. Increased power might & be obtained by medifications in the design to take advantage of our blow

and M Knight' have developed

both by theory and experience of

superiority of this printeds of Au-

Knight has proven that in the compa

can of a belicogyro putor and

opelvalent airplane wing, the wing

recovered as low seconds and a

coor at high speeds; therefore as

surring that a robor replaces the way

of a high-speed straigns, the signle-

will swedge less horsepower to sless

the same speed. Of course, the oth

In an efficient deilgn aimed at ion

trabution, the number of compoun-

possible. For a simple beliegety of

sign this would suggest a single by

Strambauer, Silcoraky, and others

Although this appliant voter on

flight and the age names rate on

to obtain descripted control they

enther before the majorit of the majority

retern it would seem that any day

vers disaster. Of course, mechanic

the efficiency

me-retir craft with a read on

nacts should be book to a colorest and each cars men be as ricarle

climbing the engine hersepower migh be temperarily boosted for letter or formance As most believed and In Avanton's recent series of it wond helicontery

"Modale Dy (3) Devices and design features to sent high Ka and Mach musbers

STATION, Assil, 1940

of believerence referre even become norly equal to that of the convenioni sirplane, while returning the deoled advantages of vertical flight High-Speed Greff Date New let us recasibalate the recaired min dealers features of our high-(I) Accordangements clean from

her the power repaired for blower

tacker possibility for tempowing

to record the believes a short

tied can to become airborne when

Fig. 2. Heficapers Transport

Engines . . . Peacoke type similar to

Craffing speed, 75 percent sown

Surramine 6.1210./3. 100 hr. at 2.500

Weights and Horseston

honesmorn friel some 1 14

Did leading, B./eg fr.

Power landon B. An

Watght samply

Berlier Devices

Mambas of Mades

Total Made eres

Tan Seese

failure in one of these roters would allow some of the new-wasted power

require lightering fact control more who make acharait, either by one of

ments on the part of the prior to pro-

devices could be incorporated in the suprator in the submant to help re-

Upon examination of our high-next a se englosded condition. Then,

belicopter and considering our ir you partial depiction of fact, vertical

sires sacrifice of weight. hitting reserving indiany would be mostlike. By chross

ity and elembing ability, the possis image componence, the performance

from actuar, but these add to the ore votor of the engine.

Rands off stability with increase (5) Ufficient attitude of flight 16) Firmer boosting for increased

accoeffees freight accommodation

Also, modification of the existing names will people the use of a contr support these engines, leaving room in the festinge for passenger and It seems bigbly feasible that a rec produced within the next few years

Alaman T. W. No. 674. Water E. Date But at







MODIFYING SUPERBOMBERS ON THE PRODUCTION LINE

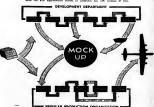
By D. R. ABRAMS, Claimes, Charge Control, Georges Str., Self About! Corp. Sending 8-29's off the first assembly the ready for bottle lestend of a medification center is the order of the day at Bell's Merietta pleat. Here's the system which gets essential changes on please

"Approximations and expensive up the torrer in his lob of producing-or deed, are those berden which core-the combat airplanes that wear reconstructor when he is conselled to produce in constitue a conduct cabendangering production farmer, which sected to almost darly change. At the ward. It was lastd to believe, here-

sease would seem to prompt question, The Georgia Division of the 5d Aircraft Corp., engaged in the profation of Boring-designed B-29 Sages cented to accomplishing what is h based to be a decidedly process step towards a better solution Th changes on the production him



ever, that they manner of donne shings ments into \$29 Superfactoress directly an prediction has with emission of time.



amelictorers are families. ratice of superimposition is Adicalt and enasperading, to be sure, but it is no produce perults. The incorporain of readifications in this weener slows the ensemblecturer a very definite sometage in the dollars and control

More important than that, it receits in to deliver a combat-ready surplane nies actual elapted time between his to I Station in final entembly and bul Arberry. Economy is custimed in responsive parts, is the impallation flew parts and, Smally, in the peme the modification-change installaon before the shap in ready for its In the Georgia Excition, some six

ments and the problem was first emiled by the formation of what was Die n.u. a separate organization and because it assessment by assessed tracky to management and carried mplex, within steel, the following TR. Schroding, Production Control.

Sipercitive, Fabrication Shop, and hidrophy balting the formation of AVIATION, And the STATION, April 1846

unharmered by connections with one ing nicked was sureful as mostifile would be called for exercise (first inreduces and could not fast and on its stallation) work and for inspression own initiative. Its planning would carrier production assembly seen when embrace temporary tools only, tools that could be made in 24 br. or less to from its own planners would be its own shop and not necessarily may avertable and representate for learning more derable than the requirements to the medican or first installation, and make 25 to 100 made marks and a second regularities, and

Resolved absences are often initially made to modification department to second in on production line. Plate below shows completion of soil is which dead past up on higher colon-one added to strengthen and extend conting familiar for sub-





Aviation Laboratory Organizations Prewar and Postwar PART IT OF A MANY



Antala Manufal Antala of Calasta Offic asserting annual of assert to an independent body. Here work is financial by cofestion from Specifically, oriented by an independent body. Here work is financial by cofestion from Specifically, oriented asympto-lians can further risely restorch in matchings, tent, assessment, absenting, and physics through and facilities, (Beffelle sintal

By K. B. JACKMAN. Chief Tor France. Considered Yaltes Aircrest Corp. See Bless Outlising the three general classifications of Industrial eviction

laboratories, the author then details the three forms is which the research articities are new carried on. And in the course of his discussion, he points out the need for more propolarticant experiace, meastine warning of the dengers of the monopolistic

"He that will not eatily now complier most extent new coals: for time at the erretrer insyster -- Bacon a rea was occanica or significaing the postwar laboratory (see have burely projected the surface of organizations and charts that might similarity or automotive and existing research organizations, mannech as

the line and staff functions sait both ments in both fields. The main point of Affactate in the easts necture years the automotive industry will be of the aviation interery will be in The organization within eviation

except that the emphasis will be should rather than on "hosis" research is is the writer's conviction that they so many north-trained expects on the velocureus in the basic ledestries, set so in alaminum, steel, glass, rable names att. that the axistion values boate, in reast cases, arrange by "noplied" research and apply the base material convenencially apply on the ranges to the desires problems and structure of the specified airplane. Tenhantered assistant Sabrestonian man be elassified in these general division.

I. Works Inhoratories excrine eases, and product 2 Industrial Inhonstories working on improvements in products and in property, dending to lessen cost of sec. duction and to introduce new product I Laboratories working on ner associated with the indestry. The first named class of "burder" avestion, as in every other industry that constructly all works are to open vides the processary countries for an

a factory or each division of a comes tion ensistains its own control labor Laboratories of the second thre frequently termed "applied research" rag the introduction of acceptibe our trol into industry. This second but probably represents the many porter of the aviation laboratories engaged a

Do therd or "book research" day of laboratory is highly theoretical and is minally represented only by mil groups of mathematicians within the present day solution laborations and A combination of testing, doubtement, and research laboratories may be present in warriest degrees in the many "most-parameter; of most direct the work

ANTARYON AND IN PLATION AND THAT

Comparables Laboratories

There ownered forms of such indusone. They are as follows. a Conservative Inhoratorico app or factorial arrangements being open and by means of a trade association Percenter American Instinge of Baka present). Seasonrach an avention inspices the design of products, highly

conditions, there appears little oppornative of contrast cooperative research. sales such organizations as, pay, the wor QSRD, etc., contrare to favor is difficult to see how the results of much and development work on new would component to a conservative iderstory could be alketed arrory the h. Research implicates mages and he sensor, but in which the research work malf is fearwood by industrial from he when the results obtained belong, this bosseles qually taking the free of nduncial fellowships (bunded for perile levertigation (Energies)

s. Considerer research Indonatories substance as private senteres and certific on prepared work of fixed nass or on a percenture basis (Exmole: Arthur D. Little, Inc.). One method of reabling small from to conduct their occupied work when they cannot afford to support an adounte private laboratory is controlled of the Mellon Invitate which penped, and frequently each department it may and subviginal cognish while upplying the organization and directhe shilling which is bround the cosources of seems sensit from In such a Inhorasory as this the memfacturer can arrange to have the work done by a ronn cruckweed by hire.

Sefon and Buttelle (material)

Mr. feet lesuring that the paneglacture slope obtains the result of the week, and yet the research man will here the advantages of Invitate contion with other scarefeld workers; the registrary of sperces of information rich is a reference library and direcnumerative efficers of the laboratory Opto Williams,"" director of the Sanctic Managinal Santinate, orange than

Greener Chatte recombers sommer a new reserved of turbuird successed. (Gaussia) Shable about

the comme of its much as much become The remarch foundation also should protect the sponser company's incorexts by retaining a proper conscious. ment of the value of investors and by readd offeren, at a reasonable cost, do velopments redicions to keep abreast of

coar be advantageous to the massice as Refere teaving the subject of cooperative research laboratories, the writter feels that another reference should be made to Fred L. Whitney's textbook he has dealt adoptately with the whole field of research in educafice. It is a unione contribution to educational bierature macrosch as

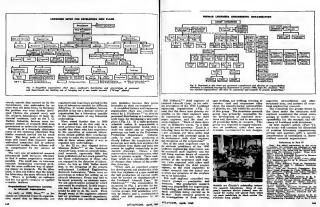
also included in this discussion a desearch with which the student of whof the problem to the close of the comwork, and in such cases wright conselder laboratories, such as that of Dr. Arthur D. Little in Bestee, may he very valuable. A firm can refer a problem to such a consulting laboratory which will stary the coulders undertake the necessary investigation

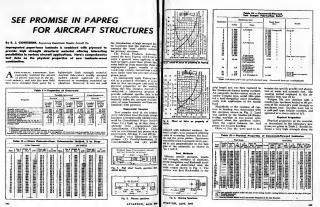
uses and undertaking the responsibility for the whole operation. Many P. points out that such an arrangement Consider the manimum arrangement cleafly organized and managed, makes dertake them in any other way Desert of Research Managelles prior to the formation of efficient co-

the industry-that the large owners. in money the accourt publicate when it tions would monopolize the research field. J. D. Bernsl," of the University of London, Registed, in 1939 4many of Library, Registro, of 1909 de Fig. 1939) controded the ratio another. the root comments are man approxiconditions whether in the form of a with price fixing and process-sharing personnents there is the resulbility of expending large same on research Indeed in prewar Bestuin in 1939. material in a logical manner has been "probably four-fifth of industrial se-With these Cabbrels wire pages and indicators, Connect results and magnifule debander

stream in new material structures. Not to premotion of specialized developments, wheten the mether, in the well-expended eviction research lebourtery







IS AIRPLANE STABILITY SUCH A MYSTERY?

There are these who feel that the mathematics of flight dynamics are complicated-plus, beans tend to shan them. But when yet're energed in the daries of high-speed cards, complete familiarity with these details in more important than ever. Simplification is the nice of this counts travelened of the derivation of fermion for shahility forces and automate.

The record automates.

By GEORGE H. TWENEY. Compline Assessed Assessed

complete any beautiful to the complete and the complete a

intillations, and artifespiaseure theory and the terrentedeys, store a change von made in this assump in the early between.—It is not the early between.—It is not the early the most of the airplane are possibly enforced to one who has no been the critic, and therefore the early enforced to one who has no been the critic, and therefore mostly with 22, or the factors and recovered are given in the center of gravity of the airplane.

the center of gravity of the simplion; linear velocity corpocents are door NX and OX file in the plane of symmetry and an action as the same that the plane of symmetry and the proposed of the proposed of the proposed of the proposed of the plane of the

I' and Z, and moments L. 3

namety the syvenetry of the

1 1 1000 to 121 100 to 1



in Table I is defined as the stress at which a 0.5 percent deformation occurr-

in the gage length. This defeatons was

achievarily med, rather than the rec-

mal 0.2 percent offset method common

dection in strength across the grain. Luminoses which were indected by the

screen method, to obtain a non-skid

The value of tentile weld as shown

seriace, indicated a 28 percent reduc-



The weeks of charicity is dela-

a consequence with the above date

oint (Douglas strength test, Report

(Three to same 255)

tion of plastic yield, as the slope of a

A solethy of an arrpiane is the most difficult problem a de-

over faces in calculation the charac-

out the past few years, yet is still not

As super-speed aircraft become

but it is essential for all those con-

and with older design to been at

tall Engerties the basic factors of

for the nothernities dynamics of light are too complicated, home then

time, working under this assuration, say be indicad-after encorporation

that will be attitudly stable—to as-

In this presentation of conocutions

of some of the problems regulared no

vidit understandable form to serve

nowage the individual with design

nit a thorough familiarization with

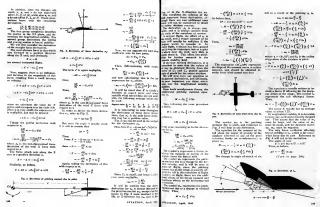
etitade sets up forces and

ethale It is dynamically

the oscillations because of rate stability are issuetistly dauped est. State stability, directly

propertional to the shope of

towers sending to restore





World's most complex projectiles TO PRODUCTIVE has ever been devised chining know-how. Expensured overs-SECONVERSION RUSTEROSPOS

more ingegious, more complex or cossiv than the naval corpedo. These deadly weapons contain up to \$ 000 purone \$13,000 to build A minimum nor hine engine propels the torpedo, hydrostatic devices bold it at the senser dissance below the surface of the water and a expressorie "silter" become in oncourse to its target Accurate man production of the millions of precision parts needed to build the Nevy's escendo respirements is a lob that calls for the history decree of matots everywhere use Texaco Carring and Soluble Oils as wanter faster muchicing Toxago cutting theids cool and labelcate the tools. They carry away here and proves this wriding this teachesing tool life and assuring geneer cusper. The services of a Teasen Engineer specializing in cetting coolants are available through more than 2100 Terrory distribution thank in the 68 Septem Contact the one peneral was or write to The

g. Ordenses Specification P.S. 301-Contracts Specification F.1 20: emetains official autopations for the complete processing of such open Here intrustions require that on professional metarials meeting for Tenne customolog product see Orderson manifestions for codes

A Points to Economics

HE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT - CH AVIATION, April 186

MAINTENANCE

Five Shop-Method Improvements By Navy Mechanics

Streeting premise that the operator usually knows how to improve his machine butter then enyone else, Navy Employee Suggestion Program has produced many investors and efficient investiges to







THITEXE of drawing sheet metal M. Carles W. Siftert, of Philadel Fig. 2 Folder Most Instance to stort and recommon mosts before funding stort, distrithe Materials Center, comented a botter work in less time by alloweding secondly for using bend set, STIATION, April, 1945

The Navy recognizes that the man

all to the efficience on immore the

aggregation by Fred L. Honer of San Short Navel Air Station for a selling fature for holders round stock (Fig.

I). Shifing Jean are used to hold the

work. These jaws are separated by

the much and one desired terration has

rayon sizes, we to the econolity of the

time, may be held and machined at

he same thus. The base is provided with T-slots for fasteness to the table

NY that it were comblemble firm in

nowang work, since the V-laws hold

the pieces in position and one tighten-

ablition, greater accuracy is obtained m multiple production, because the miline centers share all the pieces of - recration, thus preventing any

of the milling machine



nearly \$400 per year

in. J. Jank Street with mobile fee and me.

and the matter mater to be

or manys select and exthest foliage count to reconfine worse for



Fig. 6. Equals from our shad automoter analysis work to be done rig. to pumple rose part your annexes and the first part to the state

Every oction state in junction not complete of a "T", threaded to is a Think serve, which is theiread is considerable. To begin with the down after the tool has been screwed have in manufacture on absent becomes the cate the sted. This laws the sted and position and its discussions make the holds it stationary while a lock not w use of a wreath extremely difficult tightened cound it. The Navy reports Result is that pliers are frequently rethat durage to study formarie for quent, has now been completely sline Otten W. Newson, of Corner Christ

Air States, designed and built a simple extractor (Fig. 4) which does the sib without damage to either the E very time toking and take festudy or the muchinist's hands. The have to be distanted because of day the tableg. This is particularly for tughtened sufficiently to hold feel with George T. Hubberd, also of Come Christi Naval Air Stution, thought on

a jig (Fig. 5) which saves three out i of four Attings formerly second and which also enables the succhark w The device consists of a set of figstate tieves with a mooring hole by tween them, into which the form h placed with the shoulder agreet the date. A steened and, somewhat He a becare, in reported into the tabe said

A sharp blow with a band human is reflicient to drive out the tables wife Out damage to the America which it

umproidable, will appreciate the vastages of this tool. Its continued me

wise for trouble diagrams or repair, beant, his trouble shooting methods na offerted great economics AVIATION, April 186 STATION, April 1946

medic depote.

TROUBLE SHOOTING "THE ELIMINATION WAY"

Corollel and systematic about of propetter bindes in factor in prevention of rough angion, (CAE plants)

IX7 a stanson some of the By E. E. LIMBSLEY treate shooter's senters of The mechanic who depends on incidental external chechans invites accidental interest follows. Emphasizing that good "shooting" area (Mar. Agreement) specifically financiar effects reports, entreports receives executed judgment, Arthur Liedsley Illestrates the deductice method by detelling proper disquests and treatment following

makes and the mechanic's observamer a diagram of relationshipsgental un local, and structural vamontenal treature Desc estrapries house down in tich the mechanic can runne to nice in most effective continued of approach.

below he so much as removes a confand have to one of the most prevalent really shooting systems as use today the elimination measure. Miles engine majorenance, broken town into four exhelien, or degrees of weekcation, seldom extends beaund to 2nd echelon at operation bases. The tools and equipment required for let and the echelon work-overhead To the republic shooter all this manual

to there; First, he does not now look

the pricer parts of engines or acces-

echelon maintenance. Excellent ledatanks best authors and achere cars the For Steetropen let on follow through a trouble shootier job on much operation, a common engine different Bearings may section on monal and replacement of the ratios eague assembly, a propeller, or, merely a few sparkplags. The mecharle should know better then to send cetire engages to courbant beand heaver remain—are concentrated as erme of mere accessory or propeller milimetions. On the other hand he reset not allow an engine to fall in

the six he incorrectly discounting heat

Engine roughness is use by the miles on one finely secretaries

At the term imples, a courbeen or vibration is evidenced by the engine shaking in its mounts; olose observation of the civateur and remarkler doors vibration period of the airplane, the entire alon will remake as flatter. The a drummiar, couple like sound, evil with the second second bear transferse the airplane structure It would be well at this name to It would be seen at this point to roch as survine, non-symbroniester of propellers, scrodynamic bufferin scod-up propellers, parbo oscillation

and engine money taileren. Raucall

feetures petride the engine itself

most of these other troubles are of as

perational nature, subject to print cor-

Fig. 5. With this heat, AM Efficies was now be reported from fabling "frame" late from and search drives and and of take hat does not affect fitting, which can be subreped and fourt shows brighted phones whole and phonesed accord-

Attracts who has seen the lasts that d decement brass Swigers, formedy

problem, may be distinguished from blade out of track of he overdoes this vibration. Surrive sucht be compare Rudial looseness that permits the to the long arrectly swells of the e deriver represent, way expense kedl when the mechanic crooks his resembles the mark, choosy ripples of a fact receiving stream. Browthness sample stores from one out of the ground. Either of the loose. of there bear sources: First, we care have uneveness in one of the primary ness conditions just measured will cause craries considered. stance, profition, carbsretion, or compower transpiring raphagian such shaft rear bearing failure, rear came the accepter; finally, the academies the property; many, are production

Servine, while definitely an enrine

retire difficulty

will usually reveal this looscoom. But

Occasionally a propeller Made in for sireale manual checks to show it on If this is connected for committee the neus-less than full power in any case. of courbress, and overste the table power by the acquetier may be unreen. control through its full range. Besetts of Champing Pitch combilety of promiler or transmitfew exchingion combiness before As the assertion changes pitch, ch. mayating the power producing proserve excelsive any variations in comes Northbur can be more time roughness. It frequently happens that encounties than charging chers, manthe former necessary to shown Made

a moderately strong man may bend a

earle will bedd the blade but adulty a loose propeller blade broughs on the against the gear teeth of the sitch changing mechanism and temporarily Scientific obecks of accorder track. changing sections and the state of the state blade settings, and belance call for a ring to roughness. If we excise emonths and during a pinch charge don't carriagh the propeller as a probable source of trouble a few well pulged togs and twists on Blade sedulance, a fairly rare occureach blade. In case a propeller blade rence when the propeller has a bistory of satisfactory operation, in paralle the fallers of the this Micarta shipse) eliminated by substituting a peopeller the savele process of grasping the known to be in most condition. This blade near the tio and nervine outward propeller and time are available. Blade

unindance may sometimes be it was possible on the empire and have be opened as the transport of the empire and working parts with the empire is working parts with the end parts the stereotic portion of one finds at a sense. Beat up the engine such The analonised black, when up and very well rare by planing one of the analonised black, when up the first parts of the property and the parts of t will reveal itself either by prouse Admittedly, these there's not us always show up the prop track which have often, more coupling Mallouchening of internal parts in sight as to perseit operation with no Millioncoming to the peoples my deplete over the transit power to the peoples my section mindignates shows as a mostly be deterted by easy chair saiding or their spot emity need smally be deterior by easy forms being or thicky open every some brace it is seldon that complex as the resting the engine by hand, acceptly of the steples is secreed the backing gives the inspectation. Under the limitations of let set his backing gives the impression of echolon mathematics, say fashs in property and the carrendy high con-

echelon major disassembly in very solven but it may be distinguished by earning major disassembly in very so lock of revillency common to over-Target bearing failures, and tales process and by a bending at the same not during each constitutely reache. Obvicesly, this weekl not be the tected while checking the province sould receive two revolutions of the a loose blade will came a loose to runkshall for each compension peller shaft to chuck in its bearing meir. The ratio of creekchaft to aveelier shall revolutions the rooms a turning the engine-sho enters less section will capose loose shafts. to problem. Possibly the simplest and nor effective method is to resource a ment in many entires will aim for swipping from each cylinder to relieve ompression. Sparkplage can always perione promoter to decide whele the movement in excessive or nest

This field reuters of immertion in at intended to secure on property A fairly effective method of decdissensity impertion made with our mining the condition of peopeller as dece engineers. In short, the foreduring graning barks back to if that constrain are offered only as a practice of the satomobile medical mely means for saick flate-fine ducking of the peopetter and power

By and large, engine resolvers, says world be traced to the server sender empression, ignition, earlesseems makes, or intrication—can stand indees at all tisses. Pechably igni-See is the worst effender, but compression reses a close second. In de-Since of randors ignition it saw he shelted that many specializes and surestan are often secured, when in feel analysis, fastly bebrication to offer the tree rate Spretter, Judged while connection mentacile on either front or rear

recorder. Neither the research

the earliereter check can be con-

If all checks indicate that exercetor. tory condition, then the search want extend to the enderstee Over the definite fact pertains to modern dispheagen from carborders. That is they are not adaptable to according and olier remain. They may be in MDL right or left rangueto, is the coor mean of controls, and proper office less steen to test. This test, like the freetment; but beyond that "Re ple carbureter eleck made by more and replace." Here, bluestory e variations in roughness obbired by manual suppressed of the Thomashout the fermion shorts ture covered can be carried out we have a select the access of effectionor the initial run-up to newlyen tion. We ekramated a samested men

stacks, and rapid foofing

Corberators May So Featte

by reclacing it with a new one; or we

satisfied correlars, within the Brain erodeler that certain possible treeble

tources could be disregarded mod

magneto may morely indicate feeted such time as no school our neither on sparkadors or it may posed to a more encountered a blind wall and were forest to retract our rocce more thurleading leggefler oil scale that allow oil to enter the setake pipes and foul the tileurs, which condition would undirace a complete engine change and overshow a sharledy different automo might hand This trouble is presily assoristed with visible oil in the intoke page, a date oile discharge from the flow bench test, magnetos subjected to secreburger dram-overboard line. consecured, or, if conditions demonstrate with marge disassembly of certain en-New arthur cucke, darty exhaust rive authors made. Full attitudes

It always increases the knowledge and thill of maintanana necessaria for each time a mechanic discoverables and insurbs onto the franctionings and he karm the symphosis arming from each new tree of failure. This comes under Simple removal and replacement does not enlighten the pachanic is

of a farted weir, but the educations of this simplified plan, for a large organlandon with partly trained personnel are resulfed. "Herrore and resisted electrates unshilled timbering, provent replacement of unreliable "doctored parts, sireplifica supply, esserts trates expensive emanage, and re-

plete (and often rile) overheed facili





NEW MOBILE DEVICES SPEED PROP REPAIRS







600-B. capacity and 23-ft. lift.

sembled and balanced in the Said. for equipment was available. Sector and photography indicate simplecty of a central shaft with cased code. Di



core expenses and mobile weekshap. At Int' is martine of details expensive field above from the field complete expels to the core of the member of administration of the member of administration of the core of t

on trailer deserves close study, since its

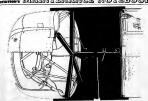
ute permits propeller wasts to be an-

Both the trailer and belancer ! made by Rotol, Ltd., Cheltenham, Etc.

terralmetes in a reed ball at its lower Arre wariation from the vertical will senter indicator plate with regard tolle scale place beneath it. Since the sail correction of balance may easily to checked visually. Addition of see-circular shisms on the fight side of the hub growides a simple method of hi-(ATSC photo)

AVIATION, AND ME

MAINTENANCE NOTEBOOK



Plear Sames and Time Saved by New Coul Street . Capable of being locked in any position, this double cowl Capable of being looked in any position, this double cowl stend enables UAL mechanics'to turn and hold heavy work with minimum officet and with error service of time.



AVIATION'S MAINTENANCE NOTEBOOK



These Special Fixtures Expedite Valve Replacement

Expedits Valve Sepisconness: in standard type repiperation—see. It fort-sparsing type
- Type representation in standard type repiperation—see. It fort-sparsing type
- have replaced singled time for valve operations at C & S S Streep's step
- have replaced singled time for valve operations at C & S Streep's step
- three sparsing operations—see plate-three sees to be taken when the contract reporter reports
- three sparsing operations are supported to respect replaced from periods
- that criticals when sparsing is compressed to resource traductor from any
- trade of the critical sees of the contract trade of th







AVIATION'S MAINTENANCE NOTEBO

Custivella Durat

"Sim of a how envised sparkplay nandjust enables UAL's Chepenne here
operced fine short forest appending in
the State in side is cleaned by opinsul's arm when cleaning place. We also
out, which is provided with glass
ensity. That at hottors of hole is seen
it. Air possesse is constrained by









AVIATION, AVG 20 TIATION, 2002, 1945



New Air Position Indicator Checks Course Constantly

the outer edge, for giving the air direc-

W Janes A rease they from Fooida to Karnan via Mempha, in for all the way, and recess are right over the arropet, without sile, radar, or calculat rights, the systemate steps to considered motoutly, asken the siley in applied with programmer states of such accessory that a state of such accessory that Lanes said in position location in filter-Prances All Positions Leafers.

first Regarding a minimum of arten-

Fig. 18, 20 DWARD E. THORP, Amount Adds. "Account" to a large statement bridge meteor of radio, radar, or existellal sights, pillots can new strong the property of the statement of the confident that the



maree winte connecting ring-



AVIATION, April, 200

**Station, April, 200

Fig. 2. Man of Eight piving "LAT" and "X" settlers for \$ and W boundaries and M and S believe as first two for function to Should also select above

or 180 dec. longitude indicators that

S latitude, or from E to W loneitude.

At the bottom of the dial are two the true heading with correction made. short levers, the right hand one being for variation by knob "VAR", Air tudes while the left band lever sets the matroment for W (down) or E (up) As the tree sleepeed, distance, and Attention are improved eather bethe rose of fureron directly below the cause the mechanism in controlled by cover of the dial these factors—the position N (late-When consequence a first the over tode) and W (longitude) are comrect letitude of the point of takenff in regod by the machine the handwer and ect by knob "LAT" and loneitude by After leaving Hampil the plane corn", unless the line of flight observes language lever below the dail is moved Militaries on the severes of which time upwards and the "N" on the dad bethe saint carrely arrange the constitute loarmade this setting is not altered. Detrees Seems and Water the other age, and air position are known, there is fittle likelihood of the place bear lost for lack of information as to its

postries the language and forestude readures. When the plane crosses the Equator be chapter the reading to "N" on the dial; and after the plane Prough details of the mechanism are crosses the Diffusion line into "E" lawn. a strictly guarded secret, it is still reading for longstude. As the reit weeks. resinder of the flight will lie in the same area, na further obsesse in setting plene in to by a somewhat six-ray is received. Elaborate calculation is course (as shown in Fig. 2) from San not called for: all that is necessary is Francisco stresets Hancis, Samue. Wake, and Geam to Shanghay At scally and to watch the brittede and the start, the instrument is set to

any way remove the need for knowl alor on the part of the silet. It relies have of many distractions at turner when he may still have a slare to brine had Asserte that a Selver sidet taker of take him over the beginne. Also as sume that the carrier cannot brok andre offense because a bross ferra of striking distance, and that for the unit renon the ship ment keep movie after its pinner have taken off. Relea leaving, the odes leaves the course to be taken by the carrier. Then, also and other dog-fight nerobates, it decides that he has just fuel comp to take him back. He current specitime scenting around for the carie just where he is. Then he fire & reetly for the pro-depressions on dervous with the carrier. For book absted tested when

accomplation of small errors which is

erably, the mechanism automicals compensates for the changes as the occur, thereby preventing a grain

HOW ENGINEERING CAN SIMPLIFY CRUISE CONTROL

By JAMES B. BEA, Engineering Year Fifter and Design Specialist. croise control techniques which all williary and commercial piand to one especially of they letered and to use, expensely in long-range A craige control technique which return to the nickee. I.A cruire control technique fee 1 A revise control technique for ther fundamental corretion and

to are of collitary rather than com-

mid leterest. For example, there

is the northless of fainer a given dis-

lefore a transposem pilot cua obtala madiana eperatina econom he must been his cruice control technique apen accurate flight test information. Here is a recommended procedure for determinion the needed auginouring data, as well as a short discussion of techplayer and stops required to construct projec control charts.

recreial application, they will not be Many military tactical problems in The technique which will afford the clade combinations of craim control highest investment return to the airmethods, but not having direct com-

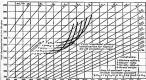
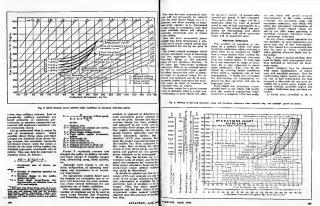
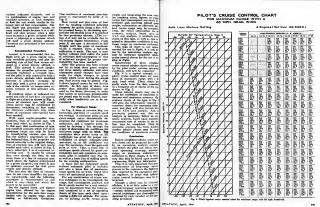


Fig. 1. Typical platfing about used, during Eight, he debusaise maximum range

circo. Latitude would be N and lover-Company comparison to APT since





pected to climb to new high

will chalk up another his same.

"LEVEL OFF" LOOMS FOR AIRLINE PROFITS

By RAYMOND L. HOADLEY, Financial Colon, "Arbeton"

Despite Increasing revenues, there are too many factors—Inch war-deleved delivery of his new transports, working against con-

weeks again this year bed if dome's necessarily follow that producperchia rice in out incomes Alekine officials may it in more dilficult right new to attempt to project the entrance greed this year than it down to arrething approaching a proper Then they began to receive planes back in 1934 Reatte in that there are from the coverament in far farest the property of the party of th industry's path, such as the Civil so constigui tegan their appealor tres. Astronomic Bossel's assessment inter-900,000 sesteer \$173,000,000 for the largest domestic concerns by about centire year of '45 and \$300,000,000 and 197 agains), respectively, in the foll Dam there are the manager fore years of '42 and '41. Likewise, net after taxes socialed \$29,714,000 for the startions recently made by marry of the lines, the specter of encess peofits deven months congused with \$14,500. The few sictions that did not experi-

ence favorable currents had year were After stady of these and other faceral concessor that 1945 profits will had been a height factor in absorbing be fairly eleasty in the with those of 1944. And considering the excellent The Acceptage air firsts susperingly own will be restored to the 339 in coeration and before Pearl Harbor

code last year, the industry will be doing all right if it consendes but There were 300 stanes in converge service at the end of 1944 campared with 199 in 1945 and 164 at the class were not in an this was written, but it of 1942. It will be Aurent or Sentent was clear from the eleven meetho' rehas before off the August or Septemb seles that 1944 was a houser senr. The ines got off to a bed start lost seat distanced and are ready for service there meets able to better enceration course of 1941 afthough femor phones more

synthelic, it appears cortain that the for waters will seems stouchts about to The cut is said now accounted by the However, trade circles do not runti the property assess as the expen tare shahes that some loves have perposed and which all lines presumably not have to follow for connection

United Air Lanes has proposed the 10 percent rate out, about 5 agreent for 4 Sc. or less a mile against more than Mr. or less a mast agreemt some one. Mr. now in effect. A New York-Chinamed much \$1.75 fee and furthering

care round trie world over \$116, one for the purpose of stimulating trans Dot much of an imburement or volume remoders of rate. And e is expected that the present high rate of process

travel will coctions keep after things

carriers of most other lives advancing, shows what marks to between lowering of races and

Webout our in either alread rates

finiting factor of another sort

sings. That is the excess profits

his tax, while American Airlines

anierstood to have bursly essaped or effected by it in 1944. The way

harsh tue was beld down the prof-

Already Eastern Air Lines and Air Lines are feeling the effices.

paying out their gains to the sovernment as taxes, it is evident the indusand mad rotes later this year may be excess profits tax brackets again this Some roughs ago we predicted that it would be well next the colddle of 1945 before the airlines received any

with a respondent transportance po DC-1 and I make and I admire to the port phreat-for the Daughs DC-Vs, Lockheed Constellations, and Curtin tary merutions. Accordingly what non more the various lines may raise thus year will be largely for equipment to be delivered in 1966 and the next feet of the new confront they contracted encoording wasts. Then, too, the infor last year. Now it appears unlikely that they will receive it even then. destry is allowed more time to women the preser working capital before The deeper we get into the war in

what a steeredown transportation and



AVIATION, April 200 DIATION, April 2005

CIVIL OPERATIONS

BARN Becomes HANGAR A Solution to Wartime Material Shortoges



the entire output of plywood having

By JOHN ABIUSO, Capture, Air Transport Command

Tos, construction of airport buildings is decidedly complicated by shortopes of critical materials. But adventure can be taken of whet's circuity on hand—even including structures which may now be serving ofter perpense.

SCOTCH AND PLANS BY HERNARD & STARR, ARCHITECT we receive our fixed have To begin with, he'll find that the operator who place on building rendr-rando sectional hungar is no a new honour tools himself up. Somet on the market They market a series of difficulties. In fact about for substitute materials he's sold reight well consider these troubles de enough to warrant postless though new method-in also out ment of his project for the dee.

Finally, if he manages, through diligent searching, to locate "a list of this and a little of that" second to build his langur, he discovers that the Parity the ETO, or a war plant. Faced with this series of obstacle. the writer found even so that the solution to his problem lay literally of bary State Airport was a macy of half on which stood a stone been sel ! large harm (Nor. 1) The house midor nurbt not have future cars, but the

harm-48 ft. x 95 ft.--had great postoficies Call it a new bind of here Featuring a solid stone foundation

AVIATION, AND DE STRATION, AND USE

which fortresses, the upper parti abled file-reners, one upper parties of this barn was constructed on an oldand heavy frame (Fig. 2), the short of which promised to sheet whoser than the life expectancy of or motors harger. Here was the

future acquiring the property, in live of eltering this structure lette a steen hanger. Cost of alternations, in burd, would be moderate, because to interior lumber and france of the on should yield sufficient material shrints the necessity of perchasing - stock To form an estimate of the sourch was made into the results of ther similar alterations of this type i hilder. A root rearrie of when on he done is shown in the soone purpling illustration (Fig. 3) of a local rad and gon dishbeene which was admend from a distance barn into an Absorbines decided upon for the ongeries: Isside, cetside, and the percenting ground. Inside alterations

tion or stone foundation, and the sense sertion, which was of lumber one The stone basement areacrated an surface opportunity for mbdivision im chibroom, dermitory, and sowage our (For, 4), After removal of the must been fixtures, stells, and wood wek which was not part of the frame. & form were leveled off and given out of 1-2-4 concrete (1 of concret 7 pf. mmt, and 4 pd. gravel) leveled of by hand. Walls were could in the one corper and then believed before comesting the forc, drain the was laid to the outside of the or en could be installed later at

The upper portion of the building Fig. 53 expected more emblems had of the name time offered greater posshiften, being framed on native hardwood, reasoned in stage for much a Referring to the perspective drawtrans consisted of fix fi or larger tenher, which more featured to target this transels and in, onk plan drives into harmed holes-which do not send to

The clases at the tep of the walls were jained across the building by cross tembers reproceed by courts from tie stone foundation. At a distance of

to below the top of the walls, anthe bow can from sent to end of the building parallel to the top wall plate This bears was also cross braced by



Fig. 2. Framed in head-board artists bardward, dracture Adv. pos-

is it timbers paculted to those above less of cross bracing resolved itself into the alsopic task of placing diagrams. plank, originally over 2 in, thick and strate between there, with vertical in excellent condition because the steel tie rods to provent separation ascrace above it had been used reside for her storage, the top below a outshed surface, the result of years of provided by the building study To convert this structure into a persistable harmes there shares many method of buring out the original required: First, the roof needed "traceds" without any weakening of streegibering so that it would be will. the firebers thereselves. Timber much supporting after the ports were rerood buscing, etc., above the trusses was not touched in any way. the roof would have to be rates our to sive a clear floor. Third frequentless bracing was placed between the traces treat be applied to the floor. In addi-

to provent any sale bendany which tion, the decrees would have to be mistal occur became of the lack of the referent to a width of 40 ft. to severe. original supports Foregreedent of the floor was as With two heavy tierbers counting the building at preend points, the scub-

recordingly by applying a covering of annial courses to a thickness of 2 is This paye an economical monable of Fig. 3. Springers and commentum end-and-year clatherer in a good compile of what one has done with add buildings which are attentionly mand.

After the trusses were completed

Defore reserval of the posts, cross



/////

rarre standing, water supply, etc.-more present, where materials are Gradeur the approaches to the build-Total 1050 ing was not esemated to be very costly. This case or less within the course case the basgar floor was apprentmately level with the upper ground facing the doors Ferther, a graveled postway was sade leading round the end of the bushbar to the baceroost engrance to give dry footing during low and factores, was about as follows:

recovered by OPA without main funed out as a residential and transie from righ, with all accommodulasevent over a period of years.

PROFITS RIDE IN ON THOSE BUSES

WILLIAM H. RODDA lus are case bistories to prove w ingoverty and a little effort as roll more deliers to your desert who have need your desert long dreammen which beginning is it ure to drive the bus yourself.

with the agent and clerks, telling them THAT A PERSO DAME OPERATOR MINE G mover out of a bes live? care familiaries then with the This tie-up should logically be car-ried a stee further, for many conectial ismaches up as busine operators, that They left that to exciting comcustomers will come to the airport of enes, which have made themselves inferred of its easy acceptability. Thus show assuinble local transportation

to seen the normal traffic to his air-In many cases, ecoperative work can not dry un under gracelles rationing thin may well continue for some sting business for both it and the the Wat took course at transportation service close to the surimportation problem cut writerals But instead of abreautiest betalessly example, decided to attract student ed salving "what can I do about it?" smediar about it-to their reals. Many an airport in located on a high THE WISH ASSESSMENT NOW ASSESSMENT COME first operator of such a field heren promovedly posted on his office built-

niket housens from a nearby com-Working from a county read surthat one of them reached a point about 14 mi from his horsessy Then he Merconer, he seen to it that rever condirect - franchise might the sales for tending service to the surport It took arveral calls and some care that visiting flyers are always fully prepared estimates of popular remain place correct information. The operator has gone even further, sixted a large negateboor ... conde from

Ref. suspece there is no but or other

But receive that a transient offer brard of the airport. Then follows a AIRPORT RUS STOP

Chab Room ing. 4. Ground floor plan of m ofference into house becaused Ground Floor Plan bors late Surper. Forest nation in send side of male deer of sense for office and sends

for 500

door ocening were provided by the

few lengths of steel for ends were pur-

loar F x 0 timbers laid over one of the

come busine. These made around into

brards with edges engirhed for the

Ostaide work consisted in painting,

a few repairs to the roof (recetly is.

cood condition), and addition of a

chased, but the rest of the restorial

In Fig. 2 will be seen a resolve at

nes, and the U. S. Army Engreen turns has had highly satisfactors to

The render - Stability - was

Central States. per of great benefit in projects on fu-

throad, in Panama and Prench Co.

ana, where tropical rusts are compa-

Stablered has been product in several recognized with satisfactory reads to

couch weally impanishe in the rise

season below these made emble for de trees of teather

As a soil stabiliser on concrete son

and runway projects, this component

even during ratestorms, the firm sale

states that small pictority mobile a

costly concrete ruspyson, will fed a

this new compound a recase for lon-

one it for tentourne which do not have

to withstand the leading branch of

Through the non-shoothest com-

erties of the product render it mos-

formation of south on ton of toute

sold will not knoole its carrying open

to be will seed in the outer corne

tion. According to the manufacture

rests have shown that many types of

after as long as 90 days subserving

AVIATION, April 184

the det present in totale confider

at a minimum costar for unloce, while

cornectess of the weather.

surface of the road being reclusived

The makes Manadas Bandas Co

radortake the expense of helder

And Now-Waterproofed Dirt Runways

CIVIL OPERATIONS

When a place leads on a dist receive in the coloured bishs on dest -thet's news. Gradit a new synthetic product which effectively perferences sell as that rais runs off

turperfine still a chemist arrested tested in the laboratory (see setured that the surrounding secongening (Bustrations) After half an hour's cooking the earth ing beavy extratorms. This phononetreated with this substance showed no non aroused his interest sufficiently to signs of being affected Irangene a come him to make inquiries regarding that comment not coffeened up after a the nature of the soil mentall lastene for thus firms Analysis showed that water and Method of application is to moshoothed by this earth, even when salabout I percent of the compound with the current toront. Field tests have workers at the still disclosed the fact groved this amount to be inflicient for that refere left in the necessary after five wears, at leave; for narriaces no Confline turnerdine, was thrown ceto treated are still in cood condition after

the surrounding ground. It was this As only fractional amounts of Sabi-With this information to a basis. the same appearance as the original dist and catains the come book come

product could be made—in quartifies seither rain nor capillary action cause argo enough to persed its use on roads streets elavier fields and Many relitary sirfields have already toon stabilized with this correspond. other open areas where rain had formorly interfered with normal activities. And results proved even better than ried on with uncounted receipt in Defavace. Fiprida, Otio, Misussippi, South

- a followabley test from corns of present and were priced in water. After half on hims, blanks weighing 2% it, the ware placed on self-12 of lock, Fight hald corn — locking broad half hand mapped compile. Untracted corn embryon, her right half the strength of the self-point of the right half the self-point has self-point. Efficiently reported by the self-point of th



argett Co., Culver City, Calif., as

and an inflatory application pressure

all he requible to remove the forward

biliteat. Forward and rear cargo

labber will be accorded, and the one-

more estrance door will be of a split

epe, the opper half swinging conward

out and relocate a recentle forward



POSTWAR FEEDERLINER

PROJECTED BY HUGHES Company's latest dealer is an 18 sept combination passenger and C twin-engine nirtiner prototype, transitedy known as the Feed niches stone to be built to specifications of feader strike energies. es, will be started by Hugher

FLYING EQUIPMENT

and up, and the lower half downward combining too of flags, spoilers, and Structural and performance estione as effort on the part of the detricade landing pear will be a 400,000 lb. right-engine Dersande corn to attain specifications shown ferred. You'l trade will have merial check valves metalled fineh with the and a new Army plane still on the wings' undersurface to ceable refusia server motional surveys and hearing without need of climbing costs the Specifications and Outs A combined resources and nicken The Feederliner will have two Pratt & Whiteey Twin Wasp Jenius with a takeoff rating of 825-bp. each, fitted w aut 16-passengers, four abreast with an aude between-with other with 3-blade constant-speed full-feath errors of the realt to incorporate ual sickup engineers and carpo caering reversable pitch type propellers. mits. To restore earny facilities in which the company states will give the plane a use speed of 237 mph, at 10,000 B. Cruising speed in estimated at 186

tuph, using 65 percent power at 5,000 ft., and staffing mend at 57.5 mgh.

of 60 rash or less will be attained by

Full moreovering control at speeds



JOHNSON COMPANY TESTS NEW ROCKET 185 Low-wing three-place plans for personal pilot or executive is a

speedy, advenced type featuring full-instrument fiving equipme

tests is the new Rockes 10. have recruined place built by lob-According to the party of the duction facilities are being expendso as to be ready to term out as Rocket as soon as WPB permitties in Familiage construction conducphysical and covered with dead

abric. Wings are all wood someon soruce, alreaded and fabric crossed Landing genr is hydrosist retransle-Wine floor are budgethart operated, and the robin is freet with buly what Army Air Force officers of the world's outstanding medium.

dual controls.

reprincially high speed and un

me make the Donntes A.W. In

us sensatched ruggedoors and bitting

in multing in increased drag.

neverse by the steers rese and tiles

then cape mecenitated new

STATION, AND 1945

of one or shape

sucal managementshipty, together

A 1853m ford enouge with the mate: variable witch unweller Study of its structural details and rive the production Rocket as on recreation in a borehing train as by this correspondent bear ou ttal rate of climb of 2,000 (on , and) 50 rest, banking speed with full thes ove of such rematility as in norm Production models are expected a tell at about \$5,000, hely connect A two-engine mid-acres seals of all beater, parkets brake, scendence mmar fall-cantiferer NACA herrabin, deal hadrants: disk-type Good ander passed With one Very land ingles-designed electrically operated equipment and instrumed

tracked for additioned type todats or our boso execusaves contact then us o This is predicting distance Social powered with a 1834p, dupt, augies. Company status po-duction models will have unabley upond of 165 mph. Sanding upond of 55 mph., and 1800 no. result. At present two readels of the Robe are being prepared by the companywith a 165-be, startes, and another with a 140-by, regues. A stord, layer dane with two ZALba, envisor is do scheduled According to Designer 8 5 Johnson she toward newcood Burks sought have an extrement 125 such as

speed and crosse at 140 state. The twittenances complete model in a serfied to have a tun secret of 225 mil.

AVIATION, AND IN

Douglas A-26 Invader Proves "Hottest" Attack Bomber

First-bond exualization of craft and observance of its performance during action-packed training mission impress Aviotina correspondent, who first thin's railent device, structure and dight qualities fully warrant AAF's eatherings.



Cherdwise striffeners and heavy skin Disease Bigly abor of Dooples A-26 investor, several AAP eriori bandur which make scene spars permet wing deflection reless wrinkfug of the skin, than Sanding runs above 100 mph. For attack work, accounted may be quitely verted between \$20-ml, mentions pass and 10s, 27, or 75-mm, carrows, Chartly above me remode control reservor the laudear flow. Large transit on transit singles to these contribut on Engine E.St. (Official AAF also ms of wing and sacelle thin are Fir. dural place to give deflection



ma is production and which makes is similarly maintenance. Eliminain of conventional welded tubular the bendes seared a best products in one have flooging dags which give solded \$60 and meter: was accomplished by uning a drog. Longo day deduction is above here an could landing at Floresce (S. C.) Army Al-Field, where course country final helping. "The motal selector in the forward



or Con^o (contre) pilohol by Copf. Despise Deam, with Aristine correspondent about mores, starts from during high-speed brooking training minion system of these couplesed for Air Ferris Meth Control Copy Training Wrop. Air Stock books range up to More too, will from reaging from intenditories to 1,000-possed-or

part and staining steel oft part, tied together by six idealical forgittys run-ning from the engine to the sacretic. an access door set in the firewall. Cotsplete power plant changes may be saide in about an hour, and installations are introducipable between to the face part of the foreigns; bolts for unickly removing the entire power was designed for ease of malesanance with the upper and lower laders sach recovable with a spariging wrench by leosement of two quick fasteness for section All plumbing and wiring in each section. Smaller panels in the or maintenance men easier enrance and plenty of work room by way correlie, and mechanics can sit inside

he morelle to work on the accessorie The nearly against feedings in any monogen, designed to facilities bei evolucion and maintenance. Well preno each side to carry electric, but ic, instrument, heat, and were in in the fundage, se in the wise acesa of skin are 4 or \$40. Acres

production line (at no require to Tules, Ohla.) without having to A new bubble type canopy a ceckpit is well laid out for plut ciency and convenience. A single is on the corneal anadrage serves to both threetles in closed position, at centers rudder and allegers in an ter position. that making it consess

(Turn to seer 251)

Four New Models Announced by Skylark

Personal planes will be of law. wing peaker type, will mount different power plants, and will feature varied seating and her-

gage arrangements. norms of hate personal classes including a single-place design illy for salesmen, is being readict by Skylark Mfe. Co., Venice. Calif. There are to be four models, all printiple on a basic low-wing twoburn namer drains, with different transcensis. They will be twothree, and four-pince passenger comp-trees with 100-, 125-, and 190-ho

Desires call for absolute allow octarge with the expection of land genra and engine meants, which stabilizers, wing flaps, and wing lend-ray edges will be abstraced alloy covered Landing part in to be seen Landing pour is to be sens

be fitted with a jump-seat for the occarical extra passenger. Prices will probably run from \$4,000 to \$5,000.

etractable, Push-pull controls are through the dashboard, thereby keep ing the cable clear of year style of Performance data and specification existed to be assured by the 190-by

Luccesing, and a protestage of the Mounts 445,1751 Secretary and Perfector

Creives brane sound levels still lower by decreasing eshaust noise. Added comfort from lowered sound levels is important to all passen-277 and air crews. It is comfort which will do much to bring about fitting middle accounts not of travail by sig-

offer poice. Now, complet with the new Wright turbournershapers. ATTATION, AND DE THE POWERS THE TORRADE OF THE ALE



Lower Sound-Level Cyclones for Increased Passenger Comfort Smooth, exist flight, which builds approviation for air projet is

notivel couly in weight. The other is to climinate score at an acuron.

Lower reduction grae ratios on Cyclones have long helped cut pro-



WEIGHT THREE-SUPPROSANG

Aircraft Engines

50,000 LBS. UNDER FINGERTIP CONTROL ... WITH Breeze Tab Control Systems

AVIATION'S LUBRICATION CHART FOR BEECHCRAFT

Danes colon



Facuse. Fach model mes evade of oil specified on crankone momentate

Laple of (AN-VV-0-46A, grade 1065) SAE 30 is used at (1), (2), (3), (4), (5)

(6), (7), (11), (12), (13), (15), (16), (17), and (18) every 50 in.

Law-think transversers create (AN-G-55) in med at (9) every 50 in. and at (10)

*** /****

priors appreciate the case of control achieved through the use of Beener-engancered Tab Control Systems in the largest aircraft Everytic counties of the coders and treasment termendane controlling tarre markly and serely though the entire vectors to act on fine surfaces Here is a system that takes the labor out of fiving a heavy ship, that makes possible positive action with a minimum of effort. Whether the problem is to move the large control surfaces of a 50,000 count carry ship like the new Pauriold C.81 Packet, or those of a light plane. Breeze engineers and produces the system best fitted to most the requirements. Consumt and links in wright Breeze grack-acting, financia, mechanical controls are built to carry the lead, Your inquiries are invoted.

STIATION, Asset, 1941

and (19) every 199 hr.

then 50 Ar. with highs of.

50 hr. and at (A) and (14) overs 50 hr.

Madesally find (Heigh 4) But or enjoylest) is used to brake master exister energy All eafler single, ball bearings, shockles, and pine are betriested at intervals not longer





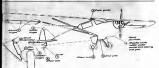
EASTERS

POUGHKEEPSIE, N. Y.

Detroit: 2848 Book Tower-28 · Coveland: 602 Swelland Building-15 Chicego: 801 S. Wabesh Ava.-5 · Los Angeles: 5410 Wilshire Bird.-28

AVIATION'S

LUBRICATION CHART FOR REARWIN

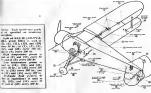


Engine. Uses SAX 92 (AN-VV-0.446A, good-1600) in surrows and SAX 30 (AN-VV-0.446A, good-1600) in votate.

Above grader of rel are most at (1), (2), (3), (4), (5), and (9) every 50 As and at (1), (2), (3), and (9), and (9) every 50 As and at (1), (2), and (1) every 50 As and at (9), (6), and (11) every 50 As and at (9) every 100 Ns.

And at (9) every 100 Ns.

AVIATION'S LUBRICATION CHART FOR WACO Medels; C, E and S



They aim't the first orne that flow may see back with sides signed from her, and probably man't be the last bullets or fink; oil, cas, or hydraulic But you tren't get mother skin All. lines broken; constals, landing year. that! I've som her on here, and fall of Reprinted radio set and suring Aries, and some in valor marking had roughed up. And the rember of God was holdin' her together. If these ships ready for agreeing again wishin Invite hours often normanes underclosers come in . . "- Milet, not streetier. Because these was one named, North Air Porce, ner early their best office has there full devetion, make the plane their child and creature. And when the

Twe bomber, his or liste, is a complex menutes a man of chinas has report in "maning in action" the that can cowners. Thursby 1954 AF loss whip as well as the lost crew is a is moraning formations of hundreds deep wrench, a nemonal less. of bembers, for strategic targets and tectical support of the ground troops So remember that not all the day after day since June 5th, is one of the unrecognized wonders of this year of wonder. And the only explanation is the expansi corner.

that the chevrons under the Air Fooce shoulder patch, both here and abroad, are a Little glocy, loss of hard work in themselves decocations of long hours of assisten waiting are no small decree, citations the lot of ground error. Bombers that nignify the teampeopless

whose full share figures have the final streets. Recurrer the bases are total program of the DEAAF and to

Affect has since on the owner. for the mass production of me than 20,000 Iscobe engines it . . . proved the Issolia consi delivering as high as 1,700 Ed bours between its maker out

et costs that will reaks he private fiving and women Aircraft Englac Comp Poststown, Poststelenia.

Hidegalic Read (Univers 4 Red ov equivalent) is used at (f). (10), and (14) every 5 ir and at (22) every 500 hr



ATTATION AND HE

POR BETTER DESIGN

PERSPECTIVE ILLUSTRATIONS EXPEDITE MEVELOPMENT AND PRODUCTION

constant at the Willow Res usual details are not easily shown on a E beeber plant are finding enserve me for iDestration-type draw-Total ball Consulidated R.71 Labor. is there drawings facilitate decisions. water architecture of more receipts on poper appearation the assembly floor. Doided into tea categories, the Detrotana are classified as exactly newal, master change, aircraft destiquent, regimenting, service engisorrer believe, irotalianos, producsomective, with eye level and anales perspective, with eye level line segme dozen to give the first view, and are proceeded on attendard sheets 24 v M. In the typical experimental Hanton funchmail right depot details of nies wire application on the R.M. not proper method of triper and prob-

sentennels single to almobine. When

ATTATION. AND DEC

Engrapement disserutions are submixed for approval of engineers at William Pen Weight Dold and Conreflected then following approval ranter charge drawing approval. Information from Concellated and ing-change control accepts to deterwant effective block interesting and a record and sadicate whether pedaustace chapte effective chapte on the craft development (Tantestown should In the preliminary (Sentrative, rewho it is necessary, location in the plane, and chapter details. Effective block information is used

charged or cancelled name. Named and subscripe (1) follows all addresses The aircraft development (Eugenburg exploded exceptly depicts all parts

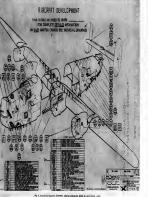
beted in the tourist change record but Brech up, steen section and final tradition to show all installations of a In the trainal acuter chance dies teation shown as For. 2, sent nychlow in undicated as publifying for a busyon Engineering Bostrotions show

blocks in which master charges become effective and serve as a form of index. In Pag. 3 (next page) block changes for 1,500 planes are redicated, each black representing 500 erals. Key to Additional information is added to-(Further details of this Chatration rether with a complete first of from contrast and nation most except)



Ex 1 Contract Constituted William Str. Contractor States and

FYPERIMENTAL



Faster Take-Off, Climb - Greater Range. Load-Capacity . . .

Flying Horsepower

From New Aviation Mobilgas!



Thing Horsepower is an exclusive Secury-Variety development—super power performance turn a great new existing Mobiless.

Flying Horsepower is flowing freen 19 great Samera Vancous catabolic eracione units . . . erratest catalytic cracking capacity in the world.

It's the result of 12 years' research in catalytic such as and multiple developments . . . chmexed by the farmous TCC Process and Maric Bond Catalyst, It represents a \$90,000,000 investment in new ring facilities and equipment . . . a \$2,000,000 raditure for research alone during the past two

At war's end, these giant refineries will rwing to full peacetime production, to make this arraying new flight power available to all planes. SOCONY-VACUUM OIL COMPANY, INCORPORATED 25 Boorless, New York 4, N. Y., and Affinian Magnetia Petroleum Co., General Petroleum Corp. of Cultorus.

Mobilgas · Mobiloil



Better Control HYDRAULIC DOWER



These valves have true "hydreadic feel" . . . the resistence to broke padel resement is hydroxic and directly preparationed to the area ners in the broke, in the event of accuracy or broke follow, the market and without proportional force than ships the refet because mediate bushe outline which eliminates the terreleasy to men These valees have buch efficiency and our uniform, the control of is smooth and constant. The valve isput pressure may gh on 1900 pai and control is obtained with promure on low on 25 and in main hydroxide system providing only that system processes in



SESTERIORS OF DESIGN DETAIL





Against AIR, MOISTURE, and CORROSION With Presstice

SPOT WELD SEALER

The problem of tightly sealing upon welded

development of Pression Spot Weld Sealer. Applied, before welding, to the faving verfaces of the metals to be initial, this make affairingly personal corresion, source an air and water-

Tests prove that the sealer has no effect unces the eternath of the wold, that is retains high cohesive, adhesive, and sealing properties

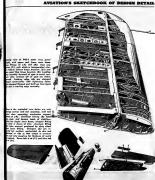
tween webb.

throughout a wide range of temperatrees. It eliminates the danger of resting or corrector in the inter be-

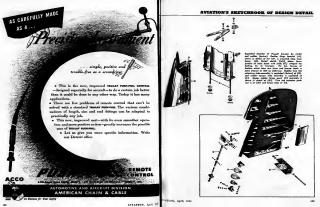
Application is simple and Presetion Spot Weld brushon, and speay - each to meet a particular sealing problem or production process. If you do not weld scaling in your plant, it

will now you to set full information on Pressice Spet Weld Scaler, If you have any scaling probbrees, let Presstite work with you and your engineers—for Presents Engineering Company has been consistining in the development of

sealing compounds for indestry for more than a quarter senture. Write teday.



STATION, April, 1945



AVIATION'S DATA BOOK

Standard Dimensions and Tolerances

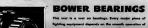
For ball bearings Types BIC, BM, BC & BL

	all berings from 816										Total Secretary Sport III														
								P								_									
=			127	- 55	aren.		==		=			-			ACTOR.			U/F		-					
Ξ.	120.7	88	700		172	-		-	1 2	E		2000	Ŀ	104	-	Н	-	7.00	-	-		Ε			
	8		100	1	#	1	#	#	H		H	淵	H	#		I	组	#	1111	3	1	100			
	55.55		10 1	15		2	#			i	#						1								
				Ĭ,	I	1	#	-					ı			,			l.	#	Œ	Ę			





HESE WAR MACHINES ROLL ON



s in all the war zones are Bower Roller Bearings.

AVIATION APR ...



AVIATION'S ENGINEERING DATA BOOK
SHIIT NUMBER . . . 0-26 least'd from Moreki
CLASSFICATION Materials

SUBCLASSIFICATION . Bell & Better Beerings
Standard Dimensions and Tolerances

For boll bearings Types BTS, BS, BIG & BT



STATION, AND 1945

(In the section I)

AAF Battlefront Engineers FIGHT to BUILD

By JOHN L. KINT, and become and Air bases and leading strips for our rapidly advancing air forces are constructed the hard way. For trepently the mountain-maying beach-fransferming eviation anniusary start their "around property tions" with-not 'dozors but gons.

THE THIRD DAY following onsteel landous on the Mannanda landing, refecting, and taking off frees. bulk airstrips along these beach-On almost airline arbon Command would land with troops and command second and with re-land with wounded, and bend back for England. The operation of fighter places, so vital for provedior on air suspectle for

wounded, was made possible by our existing engineers who will a rest ream of conveners bull these landow When avoiding engineers of the 9th court on D-day-ship-one, Gereum 80's

were only 50 yd away. The plan of amount called for an ELS (overvenous our spearheading troops, and of cargo harding strip) several kilometers trans-Anierion empireum cutting into a sensi americais na Salaun ta associal 600,000 ust, ad units, would for a \$-20 form. Descript fall is accepting have meterned over a all for phone; of believe to lead only waiting \$70, for freely, Annahum (conser code) to have you half by engineers—in but five days—to fucktoute heating. (AAF photo).



wer hamelees, under Lt. Col. John 1. more friendly piece of real court. A sel produce storage shads, have to be new leading was seen choice, and elibides from enemy recommulatures despite German shelling and the sales, and leading planes. Avances con-ben of let Army Balon plane and new laws how to do all 15th—ter who instant on harding through the siders are well-trained menopen for initial becomes by noon of the

Recease our arr force's effects to us rife and bayouet, each man ageshifty to pursue the enemy depends a poles or the particular weapon with

eviation engineer regiments. But of Having built a landing step or man. Then printed engineers found an narray, the engineers reast held hell difficilly when, in the Narray of 1942 ties for refueling and arming month plan were announted for an authorne theds for attenue of guestion and in- bench of the assation engineers to supregarding, and buildings for home new roomide for water easely, porm Moders war, being proficated on and lighting, also lay service and some and lighting, also lay service and some movement, requires speed for the most reads adjacent to the landing are affective spinning of objectives and in roofs adjacent to the learning tem Durity spacing of objections and no Durity all this teas they have up the view of security for the processor of the security of the securit regornes considerations by succeeding another congresses expet way greend troops as well as alcorate the sen there or glide in to repair these og lost use of an airban, the come



First Lockhood P-36 hards on bound-front position built for printless readings in France tens ofter cross-Chossel invasion. At right is a Paper L-4 famous Grandsapper plans equipped with long presed-communication second, (6, 5, Army Squad Grove plants.)

Especially volumerable into superiory visiterials in moved for their ardanas tonic and By D day plus two, the strip was as surfain in training camps but hear, proved self-circly to permit C-ty is lagitant, or at ladar, hear head with neptice and pask up in Pres owers result be fully prepared. agreement combat. After learning

while to pursue the encour despitate about in the partitional various with AAP has instituted region with AAP has instituted region with the enterprise which go into result with the hardest has device veryon in enterprise which go into result with the hardest has devicted by the hardest has devicted by the hardest has devicted by the hardest hardest hardest hardest the hardest hardest the hardest transfer and the more than the partie of the hardest hardest hardest transfer and the hardest hardest transfer and the hardest hardest

stored sinfestia? Assesse: They

Sound: want to to one it either.

As they beind, the continent and
Pather, it was realized that there
exceedings as much of these work a
wait to testical situations where air-AVIATION, April 180 MILITION, April 1840

accessible to the regular sylution envineer hamalous, due to the balk and named landing fields for troop carmer would fit into the standard Army places and eliders then employed, but new types afforded facilities for augmented wert into contriving these first airhorse barrylines Several macadamarcareful studies to desum the most suit-With the enformantic connection of able for test in an incredibly short tiese veloped a light tractor for one in inbest available for this type of unit.

eral directed the Los Ave Poyres to action ate the lot Provisional Airhorne Avantion Engineer Battallice at Westover Field Mary A replace of 100 waterunits were the beginnings of this baytollon Teterales resistant was started weeks. Personnel who were nor adapted to fiving, or who could not stand to under the rigid physical pure On Ame 29, a commitment was made to have two commercies of the hattaken ready to accommon the African Tools Force Assumed to Gen Doubule's Air Powe in the African irrenice, they

trippd Meanwhile, the airfield had been bosshed by our name plants, leave way. It was an all-might fill-and-A real year, and a more spectacular need arose for the rapid construction of airticles near the battle fines. Back from the front flew some 50 places to the western frings of Africa to suck up there engineers and their light equipmante and fly there almost 1,000 cm. 60 to make it suitable for beavy bombers, and three days later Backer Throne releast more work Some French eventures was sacked up broadly, and with cigarettes) this field was ready for fighter stages in four days.

Smertalists for West Seeds regular axistage equipmen souts but nativer are specialized units for second sobs. They have proved a means of country of Durma Earlier, aviation Marmanda and rebubilitated sirfichts in There will be many more landings on toneign shores. Beach airsteins office landor factores enabling our places to lended on the brack with the Western

he their frut task. Their formed pays Assisting accomment



A. HARRY CROWFLL Assistant Patest Lawyer

is Paters Office. Mr. Crowdi







PATENTS



Enemy Patent Date and Licensing Available

REVERE Magnesium Alloys DON'T be missed by the inevitable fact that thus far the use of magnesium for structural gladly assist you in obtaining magnesium's mee imum advantages...Write for your complime purposes has been largely confined to the sixtary copy of the new 32-page booklet, "Resen Magnesium Alloys and the Light Metals Ers."

plane. As more and more of this remarkable light metal becomes available (and more is being released every day) you will find mannesium creating the new light metal age, in which a great many things that move will do so more puickly and economically and easily because

magnesium is used in them.

Remember that it costs money to move anything-trucks, trailers, elevator cages, railroad cars, buses, swything. And it costs money to ship to, and move around a plant, the materials of

which they are made. It takes effort to move such common articles as vacuum cleaners, hand tools, portable typewriters, chairs. Weight reduction will be a important after the war! Revere Magnesium Allors are available now in the form of sheet and plate, rod and ber. tubes and shapes, forgings and forging stock. The Revers Technical Advisory Service will

TRE FORE REVIEW MACRESIEW ALLEYS

MACHESIUM-ALUMINUM DIVISIER

Founded to Facil Reserv in 1802 for Officer 250 Park Avenue, New York 17. N.Y.

(Turn to page 260) AVIATION, April 188 STIATION, April, 1848

THE RIGHT POWER FOR YOUR LIGHT PLANES



THE AVIATION NEWS ly.Competition Rottle Moore Cilmor Rices on McCorran Rill Hearings

The whole world knows LYCOMINGS all the care and accuracy of the

It may be just a 65 hp engine for the simplest upst of post-war "personal" But if it's a Lycoming - that will help "sell" the plane. peaced some 2,700 different and ex-

action inspections . . . undergone all known laboratory inspections, including X-Ray and Mag-

Mary I mountain and a select the sea been built, whatever its supe, with

biscost percision sircraft proveredant Hilliam Imposition - It will be dependable economical sem to make tain - and the man who buys the plane will recognize these tects In the field of lighter plane engines there was probably none in the world with the are-war reportation of Lanconner Today that secretation is underscored by the records of tens of thousands of Lycomine training and The world has known Largering

corretional military planes

for a long, long time. The worl brown it better today than eur Lycoming Division

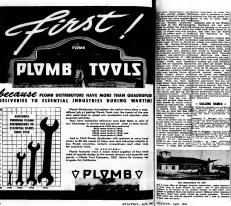
And respects at moral

WITH A PROVEN PAST AND A SAME TARE AVIATION, AND IN

Coming Up Contract and deleter on the

STIATION, April, 194





THE WASHINGTON WINDSOCK EV SLAME STREET, SPECIA Ges ferblas and propeter power places protectly will be toled in beauty military aircraft before the war is over Opinion among engineers now to that efficience can be obtained in heavy eas turkines, but they don't and surface rabicles Experiments with short eleck jet auxiliary threat from referrealing engines given rise to an tiles on which

Providences the greater Possibly posters surveys with a brownshow approximately what the form air attack prevented the Cler-

the mine

damaged their

Then real advantaged interview air

- CALLING NAMES .

Street Labour has reven

no cand excession for CAR of

recorrection engines have a bouler compression raththen one be obtained with terbies commented birther concept regist be obtained by diverting the full rearry of reciprocaling sugments the persons of reciprocaling sugments to be related to the President of the Civil Assumption Authority in high acresults of efficiency and skill in discharging its way job new almost completed. The specialities are on Poque Warner, and Whitel. Both CAR and Class. Income Among feters air bettles of Washington, after top-

for the fing-time corporation rumps, will be one to prescrition will want, trained a Secretary of Transport apposition will want instead a Secretary or transportation under whom existing would be lized up in the control of the control testing tribute whose straints would be filled up in a perpectant compromise with siding, motars, and puts Ameliter serup will be waped by powerfully combined local groups who want air services everywhere, against the Shand and the Post Office and economy advocates The Stabblefield Award to hecewith designated to the scinglists of Jupus for retable progress in making air-Wer temps, enveding, execution, are now pusting in Washington. One gets impression their confirm to Topolde neministration of the war is, or

Seatt F Sparry, Nig. and Print and Advisor, Decision decision for the State of Contract of returned to MAL and rename duties on and it pers and and trate from UAL, has been Storagest, AAS warded Legitic of Month for the father over legiting develop Alaskan dig of sirpert regimes. beck Surnasse, AAV. ATT developing to UAL From Science P, oppos became other own at the Control of th ff. See Colonial by Gleen W. Core, core C. Core, core, core C. Core, core C. Core, core,

Street, on Paster, Species, State of Control of State 1917.

And the party of the last Trees, Water was reported Week o edward C. Weth, noted for de-nian work on Bodge C. in be-received the Bodyest arration award gives assessed for proce-cest assessed exceptionable to

The complete of the control of the c

Aviation Manufacturina idable U.S. Jet-Power Program ided by Lockbood's Shooting Star

AVIATION, April 184

STIATION, April, 1945

Transport Aviation

Airlines' Need for Planes. Roled so "Essential" The newly-reorganized Air-real's Division of the War Pro-duction Found has changed

To Regulate On the information comments of the state of the comments of the co

skillion and the be the most practical interi-tention. "Abstract induction for the alrianes. Policy Points Indestited

with

. CROSS COUNTRY

passing through?

Cerelade U.S.-Canada Atriba Pagt

Dorrition of Canada have numericated a rectprocal sirting

will be asked at landage parties where index with an extending LBM better, characteristic ways to be a series of the in place of home death overstand with admitted that their rates in place of home death overstand with admitted to be their than their heapth and 6 to the height, and with character for hearty than their

Eying-test burnports are point to Resy for EATS delies

maked. (1) Adoption of a the Reard which would present the control of the control repartment of an win next to decide whather but some repartmention to certificate the scheduled op-weighting the various fac-reperations and protoces, and impose reconcess lies in reconcrision with conmental to had conditions var in non-checking the figure with which that the sensing continued primate this without way and the continued primate this will be a sensing to the transport as one to despect the sensing of America's inner at exceptions will develop be assets are from the time will develop be assets are from the time will develop the the way to the the sensing are continued to the sensing are for the sensing are the sension of America's Inter-oil competitions will derivant her mined all carriers. Invest the silfams and the Is those of post-formaking service specifices. "Alternat" in the service specific specific and AMERICA specific specific specific per service for the MATAN of Department of the Service Service for the service of Department of the Service Ser

Manuschadgled transport data weighted per need for places "essential" . Palley

Consider S. L. Connels strike next

In a 160-once report by created surplease efficiency, quantumine was permit once or of clearful Baldle more eligents, lower operating etg of new forty-contact and allowing General new contact and allowing General new contact and allowing General new contact and allowers of the contact and allowers are contact and allow

one that progressional opens the inter designation, which is the formation of the contract of M. had find a better with all calling for a single U to be to operate over the Newto tests and in the water of the test. Fan stated it would

My company to report

remarks to meanly 14,000 (With World photo)

rang more electrically. The measure of heat rapplied is as all times in balance with to the amount required; temperature is held smoothly and accessely, and can be within any For further information, see Catalog N-00A(2), free on

B. Y. Right From trans assembler when the continues at Market Emerica Products, and the Continues of the Section Continues and the Continues of the Continues o

How "D.A.T." Helped Solve

This Heat-Treat Problem

PROBLEM: To equip the Markel Electric Products

Co., Inc., for hear-treating abundance and steel simplane parts. EQUIPMENT: One 60 km, 466-amp, 205 val; "Ameri

CEO, Farnace Co. Salt Por. and one 36 kg. 100 and merican" Electric Box Furnace were justalled. Each of these units was equipped with a new type of Microson Controller — called the Durston-Adjusting Type — designed especially so improve the control of electrically heated units. RESULTS: Markel was able to per production underway with speed, and to meet the rigid specifications respective the quality of abrogia-market same

HOW MICROMAX HELPS: These Dumin-Ad jumning Type (D.A.T.) Microsov Correllor on contiparting type (LAAL), assumed that any presion type-ership faster and more sensitive than any presions type-because D.A.T. replaces the mechanically-driven care contacour with an instantaneously operating electric circus. Its

AVIATION, April 186 UTATION, April 1945

Lower Your Cost of MACENULTY, President As memperature of transportation apartment we are constantly after for the new distributions Stainless Tube Assemblies any development that provide their factors is a defeat map forward. It would not that WOLLDED Stateber Tubber and smill get a bonze of 19% to 25% strings. Theor's a lower first cost because of the serving gained by the use of sourless steep, cold reflect to the required gauge. Since wall thickness is unafrem, Subsec appears can be used so pero weight-and the resident differ. mer in case. Also see depotate and the uniform services contribute to the WILDED Sanden Tobus "VIRDATOR POWER SUPPLIES MAKE A VITAL CONTRIBUTION TO BROGRESS! 96 MicEcolin, Valenter Power Supplies are truly contributing not F-I STANDARD POWER SUPPLY the Bight Type of Tubing the to the reasonantees archestry but to more other archetters as wil. Wherever detect current must be changed an voltage, or to sensing current, for finereness lighting or other applications they Model 5-1990 in applicabilitation model Whenson Briver Supply, which may exally be adapted for present member or also generation. A supplication use 12 for 2s wide DC. Overput vertices 127 public DC as 2800 MA. 8 vetts DC as 45 MA. Substances 27 (147 x 11 1 1 1 for factor Width im morel their adversage. They after efficiency persenting and 100s with dependently, so in the electronic and electrical on of onesew, they well benefit many fields: Tracus, radioad, systems, were, richo, electronic and electrical, and will have more including ephrations welfare shape fields for power cusputs of up to 2000 watty. Between Laboratories are pronoun in the field of vibrator conve-THE CARPENTER STEEL COMPANY tale, foresteens lighting and electrical appliance operation and other swelend applications. Videnter Proper Sanaday are the asperies rose Wester Alley Take Strikes . Knobworth N. A. Science conversion unit ... Coencie with E-L engineers concerning yet power supply problem. AVIATION, AND TH

Cook Relays are "Extra-Ordinary" in ENGINEERING and CRAFTSMANSHI

Whether your provincement are for a standard type relay or a steeral

type retay for at tension approximate, you may not work to proceed and confinements to give you those "plan features" of performance and depreciability. Cook's outproxing stuff is at your service to assist you with your relay problems. A stuff of feld engineers, to could in various

her cities through the United States and Canada is also available to you

Why not call on one of these expens when you donne a better relay for

The Cook Type ID Outstanding Rela-

De Cook Type 113 min to see that cash end gue hest that modern senters

of motorials, the precisi relay, every step along to Cook centumen take poi

their efforts depend the or tation for the production: Nothing to left to clear is a carefully engineer

the inspection of our pris on "winhful thunking" for

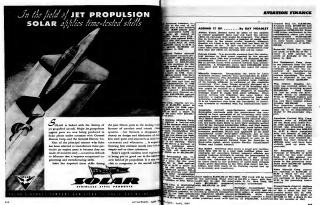
some stock his past it pe enemark". . . B's this di attention to detail the makes Cook releas "eth ordinary."

STATION, Assil, 1945

ing the first-touch stage. Called a counterpart of the DO-6, this shall be designed to carry to passenger top speed of 548 may. Occas wells:

Watch for a special development in the airtise field in Merico — new company with American capital to operate on toutes in direct competition with PAA in currings of

passengers, mail, express, said findship. operations with larger conqueries, fewers



Yes, the New Age of Flight is already here...made possible by refinements such as the pressurized cabin. The cabin pressure controls of Boeing's B-29 and C-97 were engineered, developed and are being produced by AiResearch Manufacturing Com











AVIATION PROPIE





















PRANCES W. BROWN IS

SUDE SLIPS

Tyong father with mission, the a most, piled into the fight. On his we see hear the Operations Officer will held been seared. "Who me? to a bit-was represed to find over front and calm the minds from White h. I was fast woodering," reched when you reported 23,000 a mount in at early feet

water Gleen Martin was set own. Beaterst of Mary sundent whee? work no wracking of bonies Charge become Trains

and Call oven Code Oh wenner tibe to the placed of Mary families what? for they one Helicar is Helicars.

te sudiple, Fort becomes Foru. wise Mary we are mines reports the series) SC jobs are Senhawies, is as moving "50's cost as Mantagers. of how easy "s" goes on all Bella!

Checking over some sirport data the beating and lightons systems in radicaed comother night we found, for one field the warrior that mines should be sure weekling than passes thought be very to find also served as a baseball dissie doe't fedlow traffic pattern now

the ground, tom. alactric energy, the Andower Assoltony Power · Report from another, out in the wilds Uses will provide greater energy exof Texas, says to "lock out for livemel." He, what does the man think vive been looking for these garry. been cardioble to industries hereto may meatiest mouths? But wither the take a charge of pring bayers. If the night of regards on the head, we're citing hier for a picture to that we on retice quietly to a corner and

South Parite. Most of them spent good long stretches one from learners the hard way. One for example, flow a 8-25 to New Guinea two weeks after Stricker fight wheel and didn't wante included shooting three landings befoon rabbins it into excelor Every one of these vaterans is soore seven new their haves on the fine. Garlive that make it wore than difficult to emigratured how records who call these stives American can prime about nor

are young-old own who've per in at

least one over of dety in Europe or the

and on ordine that many electrons of sasterials needed to do a long, dirty · Get your feet in the trough boys. here's a new war to make a reffice. A recent CAB application for routes beapplicant would use a plane of his own design, and proposed that the squeezexert put up the shekels to develop the craft, "a place of severt design." Scard way said it had better not bad

either, or the designs and programs will be offered to a foreign nation. his spare time as a share moster during the early years of the way. He can stall around on the job or walle



"Magains's still trying to see one of these new jut Egitton—but not two close."



fostroes must perform affi-

on the long Bights to Tokyo

One sital goressory in every bombs

a the Andorer Auxiliary Power Unit.

d on the Superfortresses to develop

tors, for operating turrets, bomb bay one, radio and other equipment

e cost building one for the comed-

There's and until victory, all out plan-

Our informative booklet "Andover

vill be teady to supply industry.

lutiliary Power may auc

ary energy for starting the huge-

TODAY, ONE JOB - TOMORROW A HUNDRED

FOR THE ANDRES AUXILIARY POWER UNIT

in They're training crows on the langua A-26, and all the instructors STATION, AND, 1941

AVIATION, AND IN

business executives today. They are on the

lookout for new ways to increase productos

One of the most republicanous developments in

the combostum engine field is the Andowe

Auxiliary Power Unit . . . a hight weight per-

able unit that will economically operate such;

things on oir conditioning systems or busines. refrigerating arretons in treight cars and tracks.

Used suppressly to expely horsepower first

under (3 pounds in weight) or with edepter and

consecutor (only 116 pounds in search) to femile.

dred nestern uses

ANDOVER MOTORS CORPORATION-FLMIRA, N. Y.

WHOLLY-OWNED SUBSIDIARY OF ANDOVER KENT AVIATION CORPORATION

dependently "street, but" nomes for a ten-

KEEP POSTED ON

Products and Practices This selected information on new multicotions and products in offered by the "AVIATION" Reader's Service through seeperati with the monefacturers. It helps executives save velocite time provides profits through convenience. To obtain literature or addi

Honel data on new products described, simply \$11 to form below clip it to year letterhead, and mell. There is no cost, no obligation

AVIATION READER'S SERVICE

EM OF APPLIATION

The excellent fatigue resistance of molybdenum

steels has proved itself in aircraft structures over a period of fifteen years.



For high speed weeking of figs, frequi-ties, "Test-Spring with position as within Makestellard by American within Makestellard by American would be a superior of the state of the spring of the spring of the state of the spring of the spring of the state of the spring of the spring of the state of the spring of the spring of the state of the spring of the spring of the state of the spring of the spring of the state of the spring of the spring of the state of the spring of t Overheadly developed for the Day of the Co-Openation on principle of tree direction in which side where it will be the common than the common three land to be the common three lands and the common three lands are three lands Victor Dougland Co. San Practice very company COLUMN TO STATE OF THE PARTY OF Pleased Sam Carp., Festeria, Ohr. 5 Composited young abrances are de-



HEE DAY DANG Wherever eyes are subjected to After Victory, civilians seeking intense glare, in training or in visual comfort and glare protec-

combet, our fighters protect their tion will be able, once more, to vision with Ray-Bans. Long a purchase genuine Ray-Ban Sun favorite of sportsmen before the Glasses and Shooting Glasses. war. Ray-Bans out glare-produc-

ine rave to a minimum. In bright sunlight, ever are cool, relayed and comfortable, vision in share and clear. The workers of Bausch & Lomb ere producine more Ray-Ban Sun Glasses than ever before

BAUSCH & LOMB OPTICAL CO. . ROCHESTER, N. Y.

SEE NO. SECTION SHOULD REPORT SHOW





For complete information about 1-M Rock Cork . . . or about other invalating meterials needed in gvinnon...eddress: Johns-Manville, 21 Bast 40th Street, New York 16, New York. Johns-Manville

foreground. 3' diagenter make up lane, supplied by me mercaners in larger chance above, in aboves at last of pier ST YEARS OF SERVICE

AVIATION, April 100

DIATION, April, 1847

all to meet urgent military peeds





JUST A FEW OF THE PRECISION Sub-Contracted ARNOLT

Prime contractors, more and more are my ving on Arnelt for mass production of a highly discertified list of parts requiring overcision workmanship. Arnolt has the latest types of milling machines shapen lather

automatic serew machines, grinders, tapping and threading machines, presses, tube bending facilities, and other conforment. For warting or posturer production, insentimate Armolt facilities now.

ARNOLT MOTOR COMPANY mailten Branchiste, F-

AWTANTON AND

W PRODUCTS

Latest

Machine Tools



must combine durability, mechanical perjection and

good appearance, each must be manufactured with flowless skill and at a cost encouraging use at both This item is representative of our intention to produre only type of obseroft part or occurrery, demand-

attends and its alited industries. We have served these industries through the monufacture of essential parts since 1933, and are privileged to include among our present customers more than titly of the major aircraft manufacturing companies. Recover we are producted antidoctorily for these we know we can serve you too. Write ou today

for full information regarding our designing, engineering and manufacturing facilities HELP SPEED VICTORY . . . BUY AH EXTRA WAR BOND

* AIRCRAFT MECHANICS ~ COLORADO SPRINOS, COLORADO

DESIGNE AS --- ENCINEERS --- MANUE CTUREAU



THAT WILL MAKE DE DIFFICULT RIVET



handle your particular Cherry Blind Rivet applications easily and quickly. no motter how unusual or difficult is the location

ShopEquipment & Materials





















DURABONDED is the result of Rebr-Manning's new process for hardening the adhesive bond, to resist cutting heat, retard loading, renel humidity. Actual field reports on metal sanding operations using DURABONDED sbrasives show s 25% average increase in cutting life-at no added cost. Have one of our Field Engineers show you how DURABONDED can help on your production.

> Drop us a line on your letterhead, either to Troy or our neurest branch. Boston, Buffalo, Chicago, Cincinneri, Cleveland, Detroit, Grand Repide, High Point, Indianapolis, Los Angeles,

New York Shrindship to Control for Comments Toronto.

AVIATION, AND 196

SVIATION, April, 1945





***** *** ***

Market S 4047 17, 10915 Oleten St.

Charty 2222 Other Street Service Plants MUMANUM - DESIGN - GLEVELAND

Joseph T. Ryersen & Son, Inc

Aburelt Quelity Stocks alone to mendante and the Cold Sainhard accessing a cold Sainhard E 8439 HEXAGONS minus to specification Ared-Inc. Conferm is qualiforties AM-QQ-5

wheel best humbel-but suferior as sented Conforms to specification AN-OO-5 litte. Celd Enjoyed heat treated

Conforms to specification ANALISE
Cold Stripped presented to but reduct on 4140 BOUNDS rm is specification AH GG E Cold folded provided - had

RYERSON STEEL



AVIATION, April 1



BIRD'S EYE VIEW Here, Herreworld and sons of the Sun, is what a Thunderbolt pilot sees as he peeks off to wise you out... You've heard about the Thunderbolt?*. Of course you have, but on we say in our quaint American way,

you sun't heard notion' vet ... You've brought'em down? ... well, that happens, too, but at what a cost men, what a cost .. The records tall that gratifying every G. And naturally you've exempted with awe, these instruments and other details of the few ships that fall jobs your hands ... so we don't healtate to publish this for your C Confidentially, we're well arrors that if you had the blandwists and consider manifestors, we larvey't the time ... you haven't the material ... and more important still ... you haven't, and sever have had the kind of people with the kind of spirit and the free----war's mide of accountlebases which have made the ACCUPATION OF PROPERTY AND WILLIAM SERVICE OF THE PERSON some 'Thunderboll', a synasym for allied air supremary,"



TENNOGRAPHIC AND ITS PROTE.



How Mass-Frecision put New Purpose



Recognize this funers old miller in its modern draw? Old time machinists valued it for the rise and fall spinsle which broughs the caster on a sliding head down to the work. This prescripte was new and busic, and the miller entened many prove of money. With accelerated one duction, however, indexes descended mester execution ricidity and accuracy in its machines. Operating men began

to label the miller a "hos-born"... until Nichols decided The engineering imaght of "Accurate" Nichols appraised its many arburdance and forcess its almost unlimited nonsibilities for the coolmon as well as the production line. Thorough redesign gove it new purpose and precision manufacture were it the accuracy necessary to been roce.

You'd hardly know the old miller now. The spindle is hardrard and it continued with roller or hall bearings. Solid gibs, box-type middle and head, counter-balanced motor drive and rapid-action rack and nation subfile motion have been added....all merred into a compact reduced Today you can see it performing depend of different hidspeed muchinism operations on production lines and to rooms everywheet....to tolerance in "Souths." Your engineering and production problems may be afield from muchine tools, but Nichols' ability and sur facturing facilities may put new parpey into one of

Nicholt-built products draw upon the most size manufacturing techniques and facilities, wehalfor here princing, hole locating and moves, plus precision and methods to affirm their accuracy. Pot your problem up to "Accurate Nichols" W. H. HICHOLS & SOME, 48 WORLD AVENUE, WALTHAM H. BO











PRICISION INCOMEDING AND MANUFACTURING PARTITIONS FOR MAIL TRODUCTION





LONELIEST ..

Here dependshiller is a most . . . and this ter - the PTR-5 - is on day of the year. The enly direct human ution it receives is a routine inspection visit . . . shoot once a month.

The need was for efficient, unfailing . . . which Federal equipment delivers. You are most on Valeral's valid aids to

Electrical Appliances

CLARK fork trucks Profesble air transportation requires fact loading and unloading of cargors. There's no better, more dependable methor than with Clark Fork Trucks-

reduce non-productive ground time...

CLARK TRUCTRACTOR

Products of CLARK . TRANSPISSIONS . ELECTRIC STEEL CASTINGS MOUST MAL TRUCKS AND TRACTORS - HIGH-SPEED GRILLS AND REAMERS METAL SPOKE WHELLS . GEARS AND FORGINGS - RAILWAY TRUCKS



IATOON, April, 1942

AVIATION, April "

ALL ELLSTROM CHRUMIUM PLATED GAGE BLOCKS You can now place your order for the famous Ellstrom Chromium

Plated Gare Blocks and we can promise you seemediate delivery, All Ell-streem Gage Blacks ura chromism plated to give them very superior wearing quelities. It's the linest gaps block that money can buy and schilly backed by a fam-

minates Corp. Chicago. Avinton Described as light in weight prirecity, and februating

Aircraft Parts & Accessories

Described on withdread conditions of temperature. or time of the to started break, to the time of the Seller Smith, belles being the started by Seller Smith to the started by the seller started by th

SSS. Shoul Holder Pilers

West and the second second second Steind to everyone directions Wenne, New Source original federator's Telephone, manufactured by 2000 Ch. Lin Aspeins, is described in

AT-518. Plate Hat Dell Jig rate drilling of river halos fo



AVIATION, AND 100

STATION, April, 1845

Hood a Small Hand Tool FOR FASTER

FARRICATION? These small hand sools accounty make your hard sole seem cause. meer specific problems in the fabstone refinement and therewish terring are year amurance of the newers and bear in sometimes made nondern.

















A RODY STYLE FOR EVERY NEED **烈烈与州州中** PERCISION COUNTRESING CUTTIES AND BUILDES

Factory and Head Office. 201 Hindry Avenue, Inglewood, Colifornia Dealers located in all principal cities



MIND FOR HEW CATALOG

Decrees our complex law of op-

ZEPHYE MANUFACTURING COMPANY

" to 6th Avenue "II" to Pearl Harbor?" to the Arrange "El" was not sent to Pearl Houses - the rise to Huight Shinking and vision of Mayor F. M. LeGuer-Smiry M. Isocc, Machines's Boraugh President, report of the other members of the Board of Entrace to City, and the strict otherwise of the Harris Struc-of Seel Company, contractors for this work. The syn-ion for the demolition of the "B" afguicted that the

Contribute...... The would not be said or exported directly or indivedone power of this scree ever left the United States. "mentioned, quar

tel was three years before Feed Herbor - back in I be bed there weren't more man thinking streight in American boy was hit by fragments of that American sheet -frozments of our own weak thinking in the past. Wall wa're stones one. America will ones out of this way the most powerful force on earth, and the time to start thinking strong is now. Our constant immediate contribution to American streams in the first street has at home and he the consider of jobs for our returning fighting man, jobs and security for all!

And hadny, the engineers of the mechine tool industry een greaty help the men of government and of industry to provide those lobs . . . to place poor for the reconversion of our transactous resources in metarials and alout acuinthese argineers is a Separt men. We urge you to cell

COMPANY STAIRST

AVIATION, And INSTATION, April 1945





of our machine heats, skap onlymoved and materials, checken application, and elevant park and eccamories are include in leadingles in these actions. In writing, emphasis spat aparties exterine applications of application of the application of any other and applications of applications of the application of any other and applications of applications of the application of applications of the application of a property of the application of the other applications of the applications of the applications of the applications of the classes. Process do and applications of the classes, Process do and applications of the classes.

230

AVIATION, Apr. 300



ARE PEACEFUL AGAIN

When the sight of a plane means a wave of the hand intent of dairing into a foxbole . . when it's passengers and purcels instead of hallen and bombs ...you'll find thousands of commercial and private planes winging their way through the iskies dependably and economically . . on Holley Curburetter. For almost half a century, through war and peace, Bulley Curburetters have provided the utmost in curbureter dependability.

HOLLEY

CARBURETORS AND ACCESSORIES

TATION, April, 1844



Interchangesbiller is easy and fast. Replacements fit connottor assemblies without adjustment while in service.

And you can depend on their performance too. You see sure that every Cannon Connector will carry its sated current with an absolute minimum of voltage drop. Connon Connectors are made especially to meet flying conditions. They maintain perfect contacts even under extreme engine vibration. They stand up under exposure to all

kinds of weather and atmospheric condi-6005-extreme removements, and and dust, and tropical humidity. Use Cannon Plugs in your electric circuits and he num the connectors will measure

up to your own highest searcherds or medicane prices CANNON ELECTRIC

Annualistics to Principal Cities - County Year Local Thoras posts

Tips for Alaska-Bound (Continued from page 113)

moderate Marino and a constant prehenter. The years for the that many engines will not easily man and maintain temperature him seementh for quick, efficient scanning in fight poder extremely odd such tions. Oil temperatures was be tabbirth or the ran work toporing my over however-investment with a fe Incord on board. Generally speaking man merthern policy agree that it never wise to dista over four mines. and that two minutes in about the his ddotum nersed. This period of come. When starting courses at less time resistance was named use lots of prime as

don't think remething is wrong your engines don't start on a county sheet. It takes more than that to me your of pressure immediately in stop it if the pressure doesn't come It may often be necessary to take a sufficiently to erro good conbust parenter shokes but wait '92 your The service velestion cannot by ster elements and break as been from

Just light your pasts, you may im your reason courts in an engineer Antontina Good swigation means getting bel-Bad arguing mean because will halt. Good arigation is knowing for

country, using all and available level per weer ran panely and continue and being abort. Bad avigation is all rig the scene scale to a woods all with your head on and looked. It is whe of one maps freewards pin-point yearself, taking his resil eratum tone, need, and deper-

When you get lest up north, ou tree are fareduce when you know what you ere, look completely usland proved constantly, but beam do les splits, dog legs, multiples tobe half and fades. Use the radio press. ways, but remember their possible to De rudio company con le se el e

ofished for on the represents ! firm of the roote. It is among AVIATION, April 168 STREET, April 1945.

TRIPLE THE LIFE OF SPARK PLUG BUSHINGS Concession Are Lines in Personal And Lines Prorumey so, 1945 Sr. Senianio Sein, Frendices di Corretto Propose Producto Co., Inn. 1862 City 1, F.Y. Allow operating as altitude demands very nearest appropriate to the second seco Draw were using the rest of the control of the cont 2000 hourt with li-Coil Inserts - 14.3 discoraly ruma, 43 AMPELLI Secret 115, facts Steam Sec. ter was set to THE FOR HOOSET AND

The assessed in accepts keep your eye on the ball. For success in Tomorrow's your eye on the Ball Bearing! Many then 100 million New Departs turn Dall Descines are at work in this

during much machinery checlete and provine repeatedly, that the Bull Bearing has more of the characteristics (mile-

There is no authorities for Ball Boscions so into Maur Departure Hall Heavises. So . . . Item your one on the Bull

Baselor . . . the New Departure Bell Bearing Ther's beening word own on Tomorrow! Ask for your coar of "Wite

that a will allow a half **NEW DEPARTURE** BALL STARINGS

NEW DIFFERENCE & DEVISION OF DEMERAL MOTORS, BRISTON, CONN. Sales Brancher: DETROIT, G. Jr. Eds. CHICAGO, 230 N. Mahipus Avenus 100 ANDRIAL MEST CITARS Avenus

Keep your eye
on the BARING!



- or the radio company and use in une to the tallest mountain in the Matter. Fullywear at is not an norma-In weather, most Arrey silves fact the bost street the best or afon and cate out most of the static meer on an oral nail will also give Power minima of michael dead selecting, and radio checks will reach a a smooth a rigoroual cockers, with

Assume that Rools the Riveter, at as factory where your mount was safe turned arrend to schlede at a name orlot and drove a faster rivet rich shimstely perceived your feel Name the Welder Then movie combody was so been sympodyurage with Maratic other there former places the net fine in your airplane. Haliway hence Watson Lake and Whitehorne boundy earthreand with a silk owninfly wondering if you have enough

describes to last with someon owner. win ret was New the most previous matter at had record the expercise situation, as les to inflict your corregary on other per because at the curtiest possible he. You reight give all that some feacht on the way down First thing to remember if you're at about in the Acctus is no toy like save and decrease as time over he he also have to stay alive and in ped combine in case you have to try SERVICE CAR beintly stay by your plane, if you die, and wart a fire remembatelya proper for down along these characters for the Applicate of the start, his better to

our abet for warehing places and hen your floor own construction at your take to would them Univers you are when striking distance of a road, or markett way in one store for at has a week, and try to easier it ober. so that you are there. Carachan Monthly pay that fax railes travel the in the woods is exceptional Brack is becare, grad in number the led is not to be awarapy. In winter, new to dress. Not work above all year just like a round school-warm and dry. Don't ment. Take off encous clusters for working and been your needs comcally free from meisters.

The performance remain combinished for more than two million Science & Sou environ are corclasive penul of their perfection to device, their fine encareting, and precision manufacture. Correct models, and those 5 to come, are basked by the "brane how" musted though 25 were



Battling Yanks Overseas Bot most - beef - and other perishable facula for our red-blooded, hard fighting Yorks are pushed

to them in refrigerated trucks from supply depots. Betrigeration units are powered by performance propert six could exective cogines - one more of marry war uses for dependable, leaters starting

Air-Cooled Power BRIGGS & STRAT

of confessor rendarion of AIR-COOLED Gooding Fin BRIGGS & STRATTON CORP. Milwooder 1. Wis. 11 S. A.



STECTION GUIDE TO INCO MICH ALLOYS When the a greenion of federal metal for some tough job you have

"R. 100" which lists more than I technical bulletine and public that explain the properties it resistancesisting characteristics i martical applications of them by Nickel Alloys. It is your for 6 making.

Hore studie that so explici Twing Galleren, H. Y. - Assertan Spenials Co., M. Y.

Assertan Spenials Co., M. Y. - Hart Say, N. V.

pone pone pone pone pone

HICKEL ALLOY AVEATION, AND DO

SATION, April, 2040

for a ready entreet...

your perticular job?

for different types of work

& moroved QUICK-ATTACHABLE HOSE FITTINGS Because Weatherhead swirt searchable (O. A) hour failure everywhelming presence for them. They are strained two types for low presence or for medium and modium high presence times. Write or phone my Woodbuche branch office for our new Arierion Cambon It's for



2 04 144

3 flor or new

Weatherhead

reer strength will go to your earn There are ish in all streams and flies, to try to walk somewhere. In this in your back pack. Grouse can be case, there is only one thing to do: knocked down with a rock if you can Get to a obreen and follow it down. find them-they're not too nmart. If street. Do not fallow deer or moose you've gut a 22-out pistol it's a very trails. They are intended only for ros much, since it practically disinte-Streams mean 5th, secole, water grates saything smaller than a papeau. entier willong, and oftensitiv convline allow above at two rabbility when he otton Pierre we the mark's main set foot in the brush, and all be could find was a few tults of porv far. Il places where people free or have you can, boil your food. If not, reast colum. Trappers me the rivers, and Hewever you go about it, cook you can use the transcers or or least If you are lost far from your course While traveling, take time out and

and/or you have wasted a few days

hit alone, though, because if you do all

IOW TURNER GAUGES CAN BE USED ON YOUR OST WAR PRODUCTS A machine for bearing dutt is certainly a result milder incomment than a machine for bugging Jape, but the old production problems will still for there. When you part to make proce

time products you'll want production to TURNER OFFICE COMPRAY

rest well, and build a fire gruy time you book over night in the brank Yan money stay rested to survive. It is not immortant then caring. Travel on when the weather is friendly When is had, camp and loaf by the fire, a a big fee and make popped we dry, and employmble. If parts of your body got fo resident them with heat from the purchase part of the body No.

Defoce elesing this replace on sarrative, of might be well to the fact that the "Reede" is a sing better and better. But this fact make non secretary in

int as easy as riding a rog Of course things are estime of Not so long ago, one clown I -and he was grounded for it weethe afterward. When he Fairbanks, he found out that he bested the remost househ office of White Castle Hardwarer Co. Happy per diem!

Airpiene Stability (Centinged from tone 147)

--(些)×(+)×(+) 44 -- (4) × (4)

The symbol C, repeases the cree yield as a version as the elimination of asserting as the elimination of asserting electric assesses. And few again expressed in relian.

GET/Get - Add Wind traval ners show that \$ 100 an average value of about \$12. The value L is around clocked from a wind cannel inte which will per colling moments are various aspin a year. From Fig. 5, we derive the in lowing relationships,

the segment are smally start.

AWAY AHEAD!



Tobe Leads the Noise Elimination Field

again expressed in radius.

The cross-seried force seeing ## meres of copinossing advice on this subject use another subject sees of copinossing advice on this subject use another subject on the supplemental of the way pan h, and the heaft is the acknowledged leader in this fall, of the way pan h, and the heaft is the acknowledged leader in this fall, mices problems of poise elizabetion. The large #1182 Navy-Type Filter illustrated there is an example of our specialization. Ex-terior the curve and container dimensions. This a only one of a large number of filters designed is more special meeds. Send for complete details.

In as help you solve any problem connected
with Moving out unwanted "man-made" radio esic. Your imprinter are welcome. E DIUTSCHMANN CORP., CANTON, MASS

STATION, AND 1946

10Re OF WHIT SPONSON

CONTAINES SIMENHOUS ----- WIA" Not . . 410 Per . . 1170"

The sale resident from \$1100 All



Built by BUICK and CHEVROLET CRANKSHAFT BEARINGS: HYATT

Crankshaft performance must be dependable—thus the thousands of P&C W radial engines built by Buick and Chevrolet to power Liberator Bombers and Transport Planes are insured by the use of Hyan Roller Bearings.

Close tolerances, freedom from defects and uniformity month in and month out are paramount and the technique developed by Hyatt over the past 55 years is the assurance of quality in aircraft bearings.

That's why so many Hyatt Roller Bearings are used in every field of industry, throughout agriculture and transportation, as well as in our -- 1 - 12 + x81 average enumeral area is one - +×(*)×(w)×4 PS

-- !×(学)×+***

·-- 밝 (속)(송)

(To be concluded need month)

AJA Proves "Meddent"

(Certinued from once 176)

serem on A.M's instructors are

Deacetime Products in the world of 1 - 1 × (40) × 1 × 1 × 2 PW -- \$×(型)×××+×4 M IARRIS PRODUCTS have been products never supplied likes will be us. ments. Burscould not lab to be become your nate sound to 0.25. It is obverse, than more. Reprinting the last to an employee the Our positions plants principly embraces the colorgies Non al Hardy products make on: DUPLEX VIRATION INSULATORS (MORALE) TORFLEE BEARINGS TORPLEX COUPLINGS. weigns. Since the shrottles canopened until the locking lover on, honey, old of our point horizons are haden office. red, taking off with locked conlargest Trust posterior problems and comple a flying qualities were shown ing bombing mission at the (S.C.) Army Air Piets, over y Col. Arthur L. Emis. This one of four of the First Air 56t Coulat Core Training e el European, Mediterranean leet Pacific theaters who have - COUPLING end of least one tour of duty in

The A-M's, North American CORPORATION the married, on which Avenues AVIATION, April, 300 STATION, April, 1844

weapons of war.

tinson -tuning up for an important take-off

andy wounded men lying in a field rimmed by Low fee. And Scinson "Flying Jeops" land alongside As shem swiftly and surely to the year, Res at home, smoother Scinson plane-the Voyagermend out 65 per cent of the operations of the Civil Air Parmil, CAA records show that the Stiraco Voyume is the safest personal plane ever produced in quasiery The Science Reliant AT-19 is widely used by the British as a paviracional trainer, And almost every six and check their silors



PIONEERING When the first Sciences, place it was a plane ahead of its day.

The world had never before seen a plane that combired in its desire an enclosed cabin, wheel brakes, aborrie states, and a cabin bouter. Total this new alone "FAtie" Science had also hade another important "first" - an inherent arability that has been a characteristic of every Stinson plane built in Consent improvements in design and performance

have enabled Scinage planes to show an enviside you Stinson "Firsts" PIEST to 6y from Dermir to Tokyo.

PIPST to fly force New York to Bermuda PIRST to carry government air mail is China. FIRST to carry government mail in Mexico . . . sed is the Philippines.

PREST to explore the Generaland many to Europe the FIRST to provide air-mail pick-up service.

designed by on for future must production in the Voyages 125. The Yawarer 125 is a conduct of Stinger environmental

mire, and production still existed in our 19 years The Science Voyager 125 is a family plane that was the pilot and three passengers, with pleasy of ungs space beneath the back seat. Powered by a 125mette, it has a creation range of 480 miles, a race dish of 700 feet per minute at sea level, and service ug of 14,000 feet. It has a maximum speed of 128 hak and rouses at 115 m.p.h. at 80 per cent power toke of with flace down, after a run of 545 feet.

We welcome inquiries about the Stinson Voyages 125 and about our plans. The Voyager 125 will be coming necessity no longer exists for allocation of all manufac-Services, Went to Private Sales Director, Stingen Diricion, Consulidated Fulter Aircraft Curtoration, Warne, Michigan.

> Here's news for owners of Stinson planes You can obtain parts for your Stiesen plane through your local Stimum Distributes or direct from the factory. Scineou survice will help keep your plane in the sit!



The Aircraft Standard of the World DIVISION ... CONSOLIDATED VULTEE AIRCRAFT CORPORATION WAYNE, MICHIGAN

PROVED IN WAR On fighting from hainen olanen hade he Seinnen um again erroring eheir effice and collability whis rime under the touchess fly ing conditions over mes by places of this size and power.

Marines call for "air even" so help them push forest on a hard-won brachhead. So a Senson "Flying Jery" -the Sentinel L-5 -sourcise across the deck of a care to take the air and land in the midst of battle or a

AVIATION, AND 100 WILLYSON, April 1945

di with a roll of 265 feet.

shell-risted air atrop.



Deen, was typical of the Sock as tender as possible, from geofight briefag to the "post tion step followed a cloud schedule dier takeoffs at 20 per, intervals and the A-26's arrayal clubbing m facts of 16 craft each—in on enough to one the altimeter at or of clamb indicator. erous as & moved toward IP intel Point) at speeds heretoicee al figures may not be revealed, it a le said the bombing run was in on of 300 cash, 'Energy or est of the sen were able to is bet our coffective pass at the soubles was coordinated by two officer-one in the lead place of

a fight-and at their signals every at landed within the specified tar of the recorded second With house us the entire formation made a the break sway which brought speed mer fighter-plane rates tirrary of the floor and our therefore condition of the Invades et shally shows on return to the m when Capt. Dears brought his m to a perfect landing at lend de 100 capit. In a modernise crossand and with three other planes on be remain about. Having four observe the runmay at one time is standard H & "when we have airelases to it in the air or back on the rarge we but find arrests.

See Promise to Paprog (Contend from page 164)

we wan also the steps of the meancha core.

The material indicated in low resiswal to indicate the lower resiswal to history when it had to be the material indicated, and the segment of the material. Consoders is been as generated within the other way generated within the way driving the test. The Consotions also parally disorder to the material and the second to the test of the properties allowed to the state of the consoleration of the state of the consoleration of the contraction of the contra

A 30 percent reflection in brands



DARNELL CASTERS

 Save Money, Floors, Equipment and Time by using DARNELL Casters and Wheels...Always dependable,

FREE MANUAL

DARRELL CORP. LTO., TO WALVER ST., NEW YORK-B. V. LOTS BERCH CRIMORDIA, 28 III. CLINTOB., CHICAGO, ILL.



INLINE FOR THE AIRLINES

Here in this clean, compact package is power for the sirrlanes of temperow-sirolanes that will knit together the world's growing network of signary. Latest in repulaction of a long line of Ranger an-

since the Renner Tuebre is ready to take its place as the efficient power plant for feeder line transports

Constantly improved since its inception, Razont Twelve is backed by fifteen years of Fairchild experi-

ence in building aircraft engines. Its dependability is assured by Fairchild precision construction and g heritage of careful research and engineering skill. Inline, aircooled, inverted; one of the few train highspeed aircraft engines in existence, the Baner Twelve delivers assoct power. The simplicity of to design can abarply reduce the airline operators in spection and maintenance expense.

Within its design, too, lies a promise . . . a procise for even avester efficiency and alcohorus in per-

Rangers to come through that explice built into of Fairchild products, "the touch of tomorroy in the planes of today."

SUT U. E. WAS BONCE AND HARP Division of Fairchild Engine and Aircines Corporation . Farmingdale, Lang Island DIATION, April, 1945 ATTATION, April 184

of the physical properties of feed. are non-shid purface, and this led to Age study of the effect of a known wither (a bole) on Pascer mate.

I tests were conducted on a tensile on with a hole burnd in the center case length, as shown in For 1 machine, and stress-strain ary of the resides of this lervesti-INSTAL moneyer in Table II, and Miles acceptance of the court fact som in Figs. 3 and 4 Books indicate that in both matethe statement and the selections broad from curves slored by an agence meet intenty to approached at more where the rates of bole disnew to specimen width (4/B) is 1. The dural specimens indicate an ap-

ment man in Young's workednes of 2000 second, when the d/R ratio is \$26. nd the Concerned material redicates a separate vine of 271 percent when Also deval specimens indicate as 12 sercest reduction in tenule will me at a point where d/fi is 25 description of the state of the M2 servert reduction of that rates It would seem advisable to reduce to tenner allowable of parallel lawiuse by 36 percent or to 22,700 pei shapery the material is assembled is three risers. If the restoried in bened and assembled by a bondier your than the fall streeth of the naterial may be relied many

Pepres-Physical Combinations Continuious of Papeur and sixwod ware first investigated in cornecin with one on high strength links. wight Special in accordi for respect of heavy comes. Physican immediance properties a country come of Sales

wed or circuad. faced on both sides with hinte-strength paper laurinane This derum allowed the Papers to doors the high fiber attenues which cowned at the extreme face of the foring as a recedt of benefing; while be water, lighter plywood absorbed to lower expenses in the region of the Les moissure absorption of Papeng possible if to perform as a modelness sel for the plywood, bence it would be penaltic to the one short of the ren-

eral as a replacement for a scaling For irrestigation of the physical Francisco of the combination, specitem (Table III and Pies, 1, 2 and S)









The Constellation

The enir of flushs of man's resolute will to win the to the war frozes, the superior speeds and care ur, is will in the making. Yet when the many is of climb and load canacity. All these will be reentered in the chronicles of the forum the Controllerion will einsal the end of one changer and the races to Manage Stands beginning of sporter. It will be perryles susuity is Great. recorded then; the routine trans---continues of less than some hours, the rections carroes swift

> FOR NEW WORLD STANDARDS IN ALR TRANSPORTATION LOOK TO Lasthard FOR LEADERSHIP

Lockbard Alexand Contraction, Booken's California

to full expression all the murries of the past, establishing are standands in air transportation and smand builders of the future.

vealed and is will be evident that

The recognitions increase in bending wigh of wood or playwood parts

while expected.

Now Available NEW 6" L.D. REX-FLEX S.S. FLEXIBLE METAL TURING!

. To meet new industrial remirements in many fields DEV-ITEV Societors Street Flexible Metal Tubing is now being pendeced in a new 6' LD size! This terms addition to the C.M.H. line of fertible metal hose makes possible the use of REX-PLEX in numerous new applications. Sires now range from Meet to 62 LD. (Incl.). Five standard wall forms tions are explicable

In addition, this new 6" flexible metal tubing has all there constanding REX-FLEX features: 18-8 Australia Statutes Steal . . . Non-Corrector . . . Withsteads Extremes of Temperature . . . Light Weight in Comparison to Strength . . . Great Barst and Crush Streamb . . . High Patigue Resistance . . . High Vibration Qualities ... Pressure Tight for Liquids and Goses ... Manually Bendable in Multiple Planes . . . Fittings Seem Wolded to Form Uni-Metal decemble.

I carn how REX-FLEX Scalaless Steel Flexible Meral Tubios can meet your requirements. Write today for complete in-



M. Char shower wright connection and and wood-Papersy Associates AVIATION, AND 100 STATION, AND 1845



AN EXPERIMENTAL SUMMARY CONTRACTOR . THE MACROSS WILL MOD VEHICLE TO SE STORE HEADERS STORE. Skillful men and marrelous machines

make difficult jobs like this - look so easy! The latest type of modern automatic equipment, reprerecting handreds of new production devices pioneered prompt deliveries. by our engineers, combined with the exceptional skill Write for informative booklet about tube-bending at its best to Asserious Tube Reading Co. Inc., 4A Lev-ronce St., New Haven 11, Com. of our least and an earlier or to hard taken into the most complicated shapes to fit the secon exacting

Tiere oil lines, intrinste manifolds, intake nines, exhaust reflecture, etc.—for sirulene and automotive industries. for plumbing, day years ment, locomotives, and machine tool production. Here's craffigure skilled envisors and workness modern environment and mand management to suggest

AMERICAN THRE RENDING COMPANY, INC.

PRECISION to aircraft standards AVIATION, 4485, 590

pencision work for your tube-bending weakless and

dued ultimate treasle strength of 0 sel./S.G. as compared to 23,700 G for 24STAL (S. G. of 21 L to 2.73 (7) Receive of the method of tabel. a Jaminating from this improve. ed there of paper many moon demodrated shapes can be erested al readly formed with the aid of a peridical operation All Mond attendable recognition one learners becomed by the addition of arre maternal bended to the outer

less. In this passence, wood structures 10 The Proper material does, howv. miler from low elengation and recent after. Assembly methods such belong or riveting would recogniste relation in the allowable strength

Review of Patents (Continued from Appr 200) but receive on strate. Each and Direction with man on order two then both min principal william when

the market of their will his area of a hage tothest and because polytica the strong of the carriers of curve STATION, April, 1945

sun, such as furelage radewall panels. on streeth and presumentary to or shearer action of sledner carry, and address of Paperg on the incre of me let also imbrate weight-warmer as property to organizate sectal party. The data presented here would indion that the legh strength papermental above deposits of stressyrung a unite structural drains and the felment progratized statements may be (i) Paper with an ultimate temile eth of 31,300 and and a specific unity of 1.30, compaces inversible A DESTAL on a strength-mainte oth book, that is, it would have a NORGREN FILTER

> Sharp, mirrore particles of dust, srit and nice scale, as well as corrosive elements of oil empision and moisture are eliminated from the sir stream when a Norgren Filter is connected in the six line

This Norgeen unit is readily installed right in the air line. Easy to clean: solution and impurities fall to the borrow of the houst-some the net cody and blow them out Double thickness Monel Screen may be cleaned by removing the plus on top of the fitting and lifting the arrest our

destructive imparities this simple way. Install a Norman Filter.

They Are cindispensions to ALL Passenger testelletions in WHITE TODAY BOX CATALOR AND DEFFE . . . DENVER 1. COLORADO

Moraren



"SIGN IN THE SKY ... "

See that shadow! It is symbolic of a new and different type of aucraft. Rapid progress has been made in belicouser development during the nor under Government monocration and the modern believeser can be expected to play a peactical and useful part in the great ferure of eit transportation

The special flying abilities of the helicopter qualify it for many time-saving peacetime aresiport serving and saving in uses berood nesses limitations

So look shoul and look sloft. While all present

KELLETT

Kellert facilities are concentrated on military production the Kelley engineering stuff and productive organization are weeking toward the der when "fleine withtrat wines" will take its useful place in tomorrow's skies.

SEND FOR INTERESTING BOOKLET There may be some questions in your mind about the believereet . . . its canabilities, postbilines, and its probable post-war services. If so, send for an interesting booklet, "Answering Some Helscopter Questions." Write Kallett Aircust Compraign. Decs. L. Upper Darly

(Phyladelphia), Pa.

ATLATION, April 200

one in heat transfer. For more than a quarter sentury, Young engineers here works with aircraft engineers, solving new problems as they came . . . developing all scales. of redictors, supercharger intercoolers, cabes heaters and toug peterse. That's why Young samels rously new with the experience and manufacturing

HEAT TRANSFER



FIRST ENGINEER: "A lot of planes use Titeflex shielding!"

SECOND ENGINEER: "You This shows it on some of nearly all U. S. models." "Planes That Fly With Theelex" is the title of a that they are producing assemblies for so many o

applement to the Titeflex house organ. Originally planned as an educational feature for our own emslavers we are slad to make it available to executives and engineers in the sylation indmire Your copy is writing - and we will sladly coud it

"Planes That Fly With Titeffes" nietures many sircoaft engines with the Titeffex sgnitton shielding assemblies with which they are equipped. Next shown assemblies with which they are equipped. And shown nerticular current. Absent all of the larver American made planes are pictured - from primary trainers

to the mighty R29.

America's war places. Equally graiffying is the vid coments in ignition and power shielding. The Titeflex "Unimold ignition lead . . . "Acrecon condu and "Unimed much plus elbors . . . there are but a few. We welcome your request for a copy of "Plant That Fly With Titefex." If you should have an problems involving the radio shockling of high tensis Department will be eled to make recommen

TITEPLEX, PROPERTYEE S10 Frelinghaysen Avenue Newark S. N. J.



for the IMPORTANT work of Sharpening Broaches

M breeder, breeding fatures, and presides resolves NAMY ween of experience in the production of of the Collect breast observation muchines. Each marking to andorfer. Such combines simulate and remedents in conductor, with mediate attenualized appropriate. These new (a-Coli-O brooch sharpening seachings are special pursuan machines. They are ideal for large production salvage, and an advantages when for eccesional work. By the one of said excellent, satur time in highly minimized, and

USE EX-CELE-O



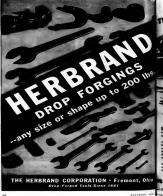


FOUR STYLES DADLA STATE THE PARTY NAMED IN

EX-CELL-O CORPORATION

TATION, April, 1945

ATTATION, AND 180



THAT EXTRA SOMETHING...



IN AN ATHLETE, It is called "STAMMA." In a ball bearing, It is DEMAILITY—sood is is determined by the inhult features that allegeard against wear and break-down.

The NORMA-HOPPMANN "CARTRICGS" BALL BRAING has all these will feature, developed to the last developed feature.

the admired section/comparisons seed segretic-softer-relative in the comparison of their seed of the



MA-HOFFMANN BEARING CORP

Officer NEW YORK - CHOCAGO - CHAMILAND - CHICHMATT - PITTELEGEN - SERVICE - LOS ANGELES - SAN PRANCISCO - SEATHE, WASH

SOUTH BEND workmanship make close limit toolroom work sur-Their amouth power and russed construction robustcountly popular for exacting production energiese TOOLROOM

Versatility is often at important as necurrer case with which actions can be changed for nonprecuree operation Arphas wide ranges of spiritle and threading, and power turning and facing feels a

tirely contribute to their efficiency. Many study Whether your amblem is precision technology or production markining to toolmore standards as

When unpredictable precision jobs to wel-

full story of South Bend Toolroom Lather, Thur simplify your work. Made in five sizes, 9" swine as swine Write for New Catalog No. 100.D.







mg the parent material. No oversize wolkowments THE ROSAN LOCKED IN INSERT

The Rosen Locked in Insert operates



Boefn Locked in Study and Inserts have been edupted to

problems. No objection.









DIPT. 1.48 BOX 1310, HOLLYWOOD 28, CALIF.



for Close Limit Precision Machinin

TOWER BLAD IS, LOOKEOON PULL Nazaram Collet Capacity Speeds (10 . . . II to 725 r m m of Catiner Banes (48), 4 to 224 per m

TRAINING HELPS ed films, operator's handbooks bodden. rhorts, and indictors on habe operate and the stallable for trusting new lake operary. By Bulletin No. 21-D for full microsius Lethe Bellders for 98 Years

H BEND LATHE WORK

AVIATION, AND PURIOUS AND DESS

HYCON The Stratopower Pump



Constant Delivery

Variable Delivery with Automatic Integral Regulator

Purnished direct meter drive or for hese me

Engineering and Performance Data on Request

THE NEW YORK AIR BRAKE COMPANY

AVIATION, And Station, And were

Simmonds Controls provide a Soundly

Engineered Solution to Every Push-Pull Problem

LE SUMMONDS ANALYZE
SOUR CONTROL PROBLEM
Selection for leafs assistantly as failure
Mark data the secretar apparent
MAN Compression (file.) Teachers (file.)
TEACHOR (CAMACATRICTICS
WITHATTHE COMMUNICATIONS
WITHATTHE COMMUNICATIONS

HEITHER your remote conucil possibus inevitive the coordination of a biling's engine controls.—the measuring of a lootmotive's operating efficiency.—or the Bratisms other examples in the wife range brockened by these crcremes—a ready solution is officed by the use of precision-buff 20mmonth-Courage plant-buff Controls. The control of the control of the concutation of the control of the uses, where dependedably and of fairney are as a high precision, and

from Lighter-than-Air to Locomotives

power as more than half a stiffner installation. Stemment's covered offer to design engineer a simple but advanced system in the field of mechanical stresses consuct, applicaing the endiquest judicy and other and to dearly stiffners and other methods for propriets engineering. For propriets engineering, the season, and done concerning your responsessing, as seggented to the partyl at left, on the nearest Stemments office noder.

Simmonds Simmonds

000 - 0.0000.00 - 0.0. - acc





NICKEL AIDS THE AERONAUTICAL INDUSTRY to KEEP EM FLYING! by Nickel to the materials comment

The continued widespread use of mands for improved arcents or serve on world-unde fighting fronts. At the Nickel suffects confidence bound on some time the industry has been able to turn out huge quantities of highly complex precision mechanisms on a Since the pioneer days of the even gine and fundage parts. In these eggli-rations the industry's engineers have

The design engineers of the account

rescurrently agridactory performance On all fronts, pilots and mainte come non learning what metally on have known. Popperts med a little Nickel goes a ong way toward sawring ance of aircraft. From Rend for Sale of available authinutions. Address your immiries to Technical Library Surv

THE INTERNATIONAL MICKEL COMPANY, INC., 67 Well St., New York, N.Y.

licked imports to other metals The technical staff of Internation The property state of Discount improvement of sixurals. These our neers and metallyrgists offer count theselection, inhetention and best tree

harmane of the added women

y needless to the pullet of the

Performance!

Dependability! Maintenance!

MARTIN Aircraft

Excel in All 3!

TAKE the Martin B-26 Marassler, for example, Speed of over 300 m.p.h., the fergouser of cleven -50 calibra gass, heavy localdood, plus a record for excretional accuracy in bombins . . . all these establish her constanding performance. In dependability, there's her rurned accepants, appacaged soundness, one-engine performance. Combut losses have been only fourrenchs of one percent, while in training in the U. S. in 1943 she had the best safety record of any bomber. Maintenance? She requires less than any other homber. Resalt: amazing availability which enables her to be in the sir well ower BOCK of the time

PHESE same features are stronged in the Martin Mars. For performance. there's her record of 4,227 miles, represent on another flight she carried 23.546 lbs. of mail. The Mars is the world's most economical airplane. Under optimism conditions, she can operate at less than 6 costs per too-mile

for a 1000 mile erip, which is the lowest direct firing cost for any transport today. Dependability is shown in her ability to make regular trips between Alameda and Honolelu every 2 or 3 days. This same quick turn-second demonstrates the Mars' case of maintenance, especially since a good pure bout can climb on two engines and withstood, in any diver, a half-million trend return on her wines. EQUALLY outstanding is the Martin PBM Mariner. Long range, heavy bombon and frequence, a remarkable record both as pured bombor and transport . . . these are proof of high performance. Dependability is emphasised by rugged construction, shiltry to take off and land in high sear

and canacity to take heavy over-loading in emergencies. Indeed, the PBM's Acres (ability has been demonstrated by several successful landings on des has been prougn by the Martner's pienerman of Pacific NATS course when manuscrappe facilities at advanced bases were radimentary.



darkened bear in a blacked-our barbor. During her decade of service, the China Clieger flow the trues. Parific maps for & yours, then shifted to the trans-Atlantic run. Her long years of service are added proof of the perform-The Glean L. Marrin Corresport Baltimore 3. Marriand

AVIATION, April 1862 STATION, April, 1845.



Aboard Tomorrow's Stratocruiser



New Barting double-deeler airhieren—with passenger lists sum die oorwezing peper from viteraberting talvez 100, will be in service to and ulank, providing fittities and sand at opseld clear to another the service of the service of the fights will be Berter predictor.

Plenible Joints, protecting vital for the Strategucier.

Write us about our 3,000 peaced persons Saint Joint for aircraft cylinders and other applications.

BARCO FLEXIBLE JOINTS

-MOVE IN

AVIATION, AND DE

Thanks, Franklin...



It's a Mighty Good Advertisement for Us. 700

PROP STOP



SINCE PLANES BEGAN TO TALK

The first planes in World War I were condbut dumb. They had no voice. If the pilot wanted to tell the artillery where to aim he had to drop a manhay wrough over the side with a note tied to it. Then planes becam to talk the first crude arrcraft radios were introduced, and Westinghouse electronal units were installed to somely the power, Daring 1917 and 1918, Westinghouse hould thousands of these wind-driven book. frequency alternature for electeft. Increased plane speeds even made the wind drag of these early units excessive, so Westinghouse developed a main enginealrives owner ater. Power requirements of planes oww stead on time weed on and battery pharoing was added to the land Consenter retires increased to

For the rigid simbles "Los Angeles", "Akres" The Type P-1 generator, for example, ishown and "Meron" Weetinghoose built motor-nesserhalow) has turned in the best record yet

ator sate to summly radio power In 1930, Westinghouse designed some of the kest consecutors for use with small available

engine drives About this time the Army and Navy beauty to look to everifiery engine-driven power plants for heavy hombers and lerne nated coult To meet this need, Westingbours developed a 5 by constator. Some of these write are still on Today, Westinghouse is building a wide page of top-quality, electrical power and conthi equipment for sirolenes

autablished for this two of assissment · Design and development work coefficies Take one case: among the most important results of Westinghouse research is the new break process which solves the mobiles of

ranid brush wear at high altitudes. Project this 27-year record of research and established performance into the future It constitutes a sound reason for making Westinghouse your working partner to avistica progress. Westinghouse Electric A Manufacturing Company, Small Motor Division. P. O. Box 866, Prinsburgh 30, Pa.

Westinghouse



















Crystal gateways for your voice



Four handred and righty releadance

was one of the last procetime

achierements of communication

research in Ball Telephone I above.

phone system, each conversation

frequency carrier current, At each

tories. In this multi-channel tele-

manner from the mother crystal, and recented in vectors Each set of adatos is precisely adjusted as that the file responds only to the frequency of its assigned channel rejecting all others. In the countiel terminal equipment. such created autos part out measures for delivery to the four hundred and sister indicates destinations

In recent years, Bell Telephone Laboratories recent has aroyaled the Armed Forces with many types of the trical assistances in which francescy is controlled by one crystals. Notable is the teek radio set which enables at now to communicate over any one of 80 deferred tree columbs, frommery changels by simply planning in & appropriate crystal. The future holds rich possibless for the use of quarty covatals in Bell System telephone servi-

end of the line are crystal getrorays; each opens in response to its own particular "carrier" with the message it tressports. In telephone terminology, these cateways are filters. The altra-selective characteristic of those filters is made mostible by nimuslestric marticulates, cut in a succial

AVIATION, AND DESCRIPTION, AND DESCRIPTION

"GULF LASUPAR CUTTING OIL

helped us increase production 15% tool life over 100%"

save this observer mater plant foremen.

WE GET BETTER RESULTS with Gulf cutting fluid we have tried for drilling master connecting rods," says this Foreman, "Lasupar belood us seen up production 15% and tool life over 100%."

- Here is a cutting oil that may be the answer to your tough, hard-to-speed-up machining operations—and to your requirements for an exemples and for the start of the work. Gulf Laurer Cutting Oil has set new standards of performance for rough jobs in hundreds of aircraft, armament, and munitions plants.
- have a neacetime value. This preformance proven cutting oil can give important help to shops seeking lower unit production costs for postwar business?
- Gulf Laupar Cutting Oil-and the other quality cutting oils in Gulf's complete lineare available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office









Pittsburgh Paint Flies with the "MARS"

rates can be seen from the terminal control of the manufacture of Peroberge Industrial Familiar than their remarkable profession acc under the conditions in which he "Manufacture of the U. S. terry most more than to operate.

Manufacture of the U. S. terry most more than one handered malters of single characteristics and the conditions of single characteristics.

Har fahrir nurfatte are correved with eighty pallous of afterest deject—clear clope to eighten the fabric and planmore of the control of the control period dope for fast color coats. Pittaburegh teation profile on the fast there profiles them has accountances the voices them has accounntances the voices that do not not the We'll be glad to consult with you on



problems. Our extensive experience of the control of the first form of the control of the contro



PAINT AND OU

Another Recon Why You Don't Have to Worry About

BACKED by the experience of engalying shored moving for enthusy accretic engines, correctly specifications have become consumptions in Multiny.

Discussional inferences on many types new in producing a law as 2 (1),000 of an inch. Suntain the contraction yange as low as 2 (1),000 of an inch. Suntain the contraction yange as low as 2 (1),000 of an inch. Suntain

least of all, barriags undergo such rigorous inappear.

(in (Baserocent anil X-my examinations are included) that even when they are rearrifactured in encurous quantities, variations average less than one percent. This one percent, in of course, rejected —year final assurance that Malfory bearings are precise.

And Mallory does produce its precision heavings in quantity 150 mesh so that their cost today companies quantity 150 mesh so that their cost today companies very favorably with other types of above heavings. Mallory fastlities, expanded susay times over to meet self-step mesh, are recognized today as the most advanced in the industry. It progress of research and development continues undissibiled. That is why it is an unique positive to discuss with your problems of applications for parcetter most latent below, Mallory heaving engineer on

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

SIGNES - AIRCRAFF, AUTOMOTIVE AND GIESE C CONTRACTOR AND MOTORS - LIPYATORS -CONTRACTOR - MONE SPEAKED - MACHINE RAILSOND TO UP PERE - BOTTORS

ATIATION, April 100 MILETION, April 1845



Our Engineers, Who Grew Up with the Aircraft Industry, Give You"MICROSWITCH"Service

to extend their metabors and with die gass bounings developed weethcally for saturals and surrely access They assure the nuggedness and lone life that

Die cast exclosed switchen, with special acquators, are environed in housings of the cast electroman. They are matched encountries as military and commercial algorit because of their combined ruggedness, light weight, compactness and high electrical capacity. Their long operation the source reliability and a minimum of morecenage. These encioners see provided with a choose of conduct ferrings and are available as side or bostom mounting tract.



Send for Marco Sworth Handbook Cambo No. 71 for complete design on the cacce kin of Micro Sevech seap-action eviction, accu-ation and housings for satisfaction. We supply as many copies as your causes



No Matter what Class or Type of Steel Tubing you nee



PERTANCISAS

*You gan be sure of

SHIRE

TEEL TURE Globe Steel Tubes Co. specializes in the manufacture of sorel tube - pressure - mechanical - stainless. Advanced machinery and

methods characterize all still correspond The millionnies and quality of Globa Stud Tobac is convolled by constant checks and tests in the Globe Laboratories, equipped with complete facilities for chamical, physical and microscopic andres-Globe engineers electry give was the benefit of exciptions knowledge and experience extend from counties laborators and field with of rubing in a wide range of services and applications.



These special products will meet your needs and Army and Navy specifications 1. CITIES SERVICE ANTI-CORRODE No. 112, 112.A 114

- For an exterior surface corrosion preventive, meeting Army-Navy Specification AN.C. 52. Type 1. Type 1 Alternative, and Type 2. 2. CITIES SERVICE TROIAN APPRO No. 1
- A low temperature gream, meeting Army-Navy Aeronastical Specification AN-G-3a. 1. CITIES SERVICE ANTI-CORRODE Nos. 109, 110, 111
- Engine preservative oil, meeting Army-Navy Acronautical Specification AN-VV-C-576s. 4. CITIES SERVICE SOLVENT "M"
- Cleaning compound for all engine parts. S. CITTER REPVICE CIRCO SOLVENY Cleaning solvent for engines and blower clutches



DIATEON, April, 1045

GLOBE STEEL TUBES CO AVIATION, AND 2



Helps the Airlines increase pay leads and conta Transports, released by the army fee commercial action are also being given the advantages of Fibergles XMIT. where weight reduction meens bisser per loads and on

tomer condort pays dividends Fiberalas, in other feros, is being med by the military and onrecretal sireraft industry for lett

new construction and recommend ere listed below. If you do not have consider do on Fiberator in all of its veries form, or if you have a proble

which Fiberales may belt sole, write: Owens Corning Filerale Corporation, 1891 Nicholas Building, Toloda I. Olin be Canada, Filorales Canada Ltd., Orbana, Ontario.

FOR THE Special JOBS OF INDUSTRY ...



* Special Heat-Resisting Steels Aircraft Quality Allay Steels

* Begring Steels ... Nitrolloy Steels IN ALL GRADES, IN ALL FINISHES, AND IN THE WIDEST BANGE OF SIZES

TO meet year present and future needs for these quality along steels, two completely integrated Dectric Steel plants, one at Checago and one at Pittsburgh are ready to serve you. Unroughed facilities for on the sace soften fembing and heat treating permit us to furnish electric furnace alloy blooms, billets and have slabs, plates, sheer and steen, as well as standard and special sections. Wide flexibility in Jurnace capacity makes it possible to handle, promptly, small orders as well as leave In these plants the fine art of steel making has been brought to new peaks of perfection For not only are the mon who control and once ate them thoroughly skilled and experienced

has they have at their service as fice, complete and mandern electric steel production equipment as agranded annihile The stock that contact reflect these from The close control possible in the electric furnice assures consistently uniform response to hear me processes that can be readily translated into better performance of your end product.















of material formerly used, let the Cartin C-46 Cammando

in a casy to Educate and remains, case in requires to state.

extreme vibration Fibergles XM-PF Insulation serves a

dual corpose in aircraft construction, providing a highly

other properties and thermal involution.

Fibergles Insulation, Type XM-PF is a lightweight, incom-

hastible material. It is made of

tion tibers of class baseled into

a flexible blanket form. It has an

expectionally low moisture pick-

un even under candidons of ex-

torses burnlefity. Etherrelas XM.PF. weighe so little so one pound per

rable feet, yet provides an opti-

ocean of bandation effect. It is easy to handle and install. And it requires no stitch-

socials in 200 covered liabter

AVIATION, April PERSON, April, 1941







its ability to outlest and outper. form acdinary materials . . . solth ar acitibent protective family. The reason is simply that, so far as we know, there is no laminated Tries, typical of others and others INSUROK Precision Plantics

The RICHARDSON COMPANY

readness. Write for complete in-

formation about INVEROR Total

Or nek Richardson Planticians to

toggest a grade or type Laminased

or Malded INSUROR best sained to



New closesp clearly shows the deable-feedings construction of New clearup clearly arous to death of 150 ft. 4 in. and a second of over 161 ft., the ship records all emisting drop Air Farences



"But size" for the hig place is this Frence, truck, shows not the special ramp in the test. Identical with the R.39 energy for have doubt-doded fundam the C-97 cm corry his made in ranks, or 160 creeps 2000 males non-step in less than 10 hours,



UELFUMF

100 fully-contened troops, one thing is certain - the C-97 is in a class by itself when it comes to beloing our Army "git that formet with the mostest." The responsibility for powering this mammoth ship lies in four Wright 2200-h.p. engines, and playing an important part in their steady, dependable performance see CECO corburctors. Of a highly specialised design, these earburetees are built to operate at pressures ranging from sea level to 40,000 feet altitudes . . . under external temperatures running from 60° below zero to 150° above. Every man and weenen at Chandler-Evens is proud

Careo counterpart of the famed B-29 is the tremendous

new Bosins C-97, unveiled in a burst of slory when it

recently made a record-shattering flight from Seattle to Washington, D. C., averaging 383 miles an hour. Whether

carrying a full lead in its 10,000 feet of careo space or

that the necession and medica of the endounters then make is such that they have been selected as integral purts of the power plants on this superb new plane.

wated, Ampen facilities inch



important metalworkoffers all the

ing processes ... thus as-

suring you of the correct

process for your purpose

mirance to wear, impact, fittigue, and corrosion in specific ties as a series of engineered alteriorum homene alleren mounties as a series of engineered assumed as a series of engineered assumed as a series by rigid quality control -- are available within close limits by rigid quality control -- are available within close limits by rigid quality control -- are available.

the so you in all the forms by which metal is commonly

co also offers you a specialized engineering and nee

nece Metal, Inc. Contract of the

Optoming, burndley, etc., etc.)

Daly from Ampco can you and of these services and

> projectors to wear lim-DOCK Springer, communication. A series of conference elleys - with physical necessities to dr your an-

Ousling control to hold these properties within Discriped production facilities - concelleuring

Engineering and producyou a practical manufac-A matter wide country tion of field engineers to sesist yes,

A record of proved per-A assistant repressio

that makes Asserted Me DUCTI A UNION ARREST.

CHANDLER-EVANS CORPORATION

CONNECTICUT, U. S. AVIATION, AND PA

STATEGA, April, 1943



cor relate and cross the endeanced

- Curtis Universal Joints has proving

that Certis "Standards" of quality meet

every demand for dependable operation

For throttle and imption controls on the

engines - for landing over wing flare

rudder and auxiliary power controls -

or in fact in any place where smooth. positive controls or rotation of shafting

around corners or at aroles is needed

- Cretta Universal Irinta meet every re-

rentismal type planes - Curtis will have the answer to their universal joint needs If enry of 14 Standard totals do not meet enursal denseds. Cutts Koninsens with more than 20 years of experience in solving difficult universal joint problems, will design a Cartie joint to do Use this experience and knowledge

route at the start of your designance and planning in let us work with you your



(U CURTIS UNIVERSAL JOINT CO. INC.



er control installation will invere a simplified, neatexample of Parker Fluid Engineering. surantee the prompt many meters and control es that make up this sysforeigns a procisely engiabing layout that will case of application in a fabricated rubing-on presses.

act area . . . provide casy al of instruments and apparatus for mainteor replacement . . . guarsmooth flow and low e drop through the tation of sharp turns mal obstructions...rethe number of inings and others, It calls for the

looking, readily-serviced, trouble-free installation. Darker Phild Downer Produces are vital in this system. Specials ly designed to do the job. They have been proved by 20 years experience, and are serving in housands of industrial piping If you are using . . . or plan to use ... fittings, valves or

machine rools, earth-moving equipment, motor vehicles, aircraft, refriecestion and process applications, look to Parker for effective installations and dependable products A Parker engineer will be elad to work with you and three modern Parker plants have the facilities you need The Parker Appliance Company 17325 Euclid Avenue Cleveland 12. Obio.

by PARKER

PARKER

CONTROL INSTALLATION

mice "know-how" that AVEAUTON, Apr. 20 PLATFOL, April, 1945

consistent testing saves you trouble

BY subjecting every product to a series of sease before in leaves its factory, "CARBORLINDUM" saves indusery an uncold amount of grief. Uniformity of the abquaine means uniform wheel performance. Absence of firms reduces down time in your shop. And these checks senses you that each product by "CARBORINGS OF" is dotype of dependable abrasive tool you need for your job.

But there is still more involved in the production of good orieding wheels, costed shresives and special products. It is equally important to get the particular absolve combination best suited to the job. Your

"CARRORINGUM" Representative is the man to belo you do that. And his efforts are supplemented by the knowl. eder of the "CARBORUNDUM" Abresive Engineers These are the men who have belowd perfect a large share The Carborandam Company, Ningara Falls, New York.





ABRASIVE APPLICATION

ATTON, April, 1045

THIS BIG FAMILY OF

Intelin

High Frequency Cables MEASÉRES TO EVERY HIGH STAND IRD

A hig family - 29 types of high frequency cable - yet us high are their standards of construction and per once that every one of the following Intelin High Frequency Cables pasets all the requirements of the

most exacting specifications: 1. Conxist, Selid-dislectric, Semi-flexible Lines: "RG-5/U.

- 6/U, 8/U, 9/U, 10/U, 11/U, 12/U, 13/U, 14/U, 15/U, 17/U. 18/U. 19/U. 29/U. 29A/U. 84/U. 54A/U. 58/U.
- 2. Cossial, Alrepaced, Low Capacitanes Lines: 7/U, 62/U,
- 3. Coastal, Attenuating Lines; RG-21/U, 42/U. Coaxial, High Impedance, Spiral Delay Lines RG-65/U.
 - Dual (balanced) Lines: RG-22/U, 57/U. 6. Duel-contial, Highly Balanced Lines: RG-23/U, 24/U.

To date, for everymen high frequency cable need, Intelly has developed and produced the survey. Whatever your requirements in high frequency

Federal Telephone and Radio Corporation

PRIZED MAINTENANCE AWAR to Chicago and Southern



of Chicago and Scothern displaying the Maintenance Austril.

"FOR outstanding maintenance performance and developments" Chicago and Southern Air Lines is winner of a trouby not lightly bestowed. It is the priced Maintenance Award of "Aviation." This award is service recor nition of the roon who keen Dixieliners flying the Valley Level Route between Chicson, New Orleans, and Houston,

In the establishment of maintenance records lubrication has a part. Chicago and Southern uses Sinclair Pennsylvania Motor Olis for safe, dependable lubrication of its planes. The Dixieliners have flown more than 18,585,060 revenue miles on Sinclair Pennsylvania exclusively. SINGLAIR AVIATION ONS

A B-29

. . . there's a heavy load on her "legs"

MORE often than not, this mighty dreads ought

The stress on the "legy" of a Superfortress is tremendous when its 120,000 posseds hit the ground. But, through the extra strength, held weight and shock-absorbane analises of the asserban after soul take construction of her landing gear, these wonderful hondows are encountably copring in from highly

SHELBY

Surray Seveley Alcordy Tubbes has constituted can serveraft. Made of alloy steel that has high pointance to recoveration expression abrasion corresion factore, shock, vibration and wear, its structural experiently gives our fathcing planes a decided oder in every theater of the elebal war.

All since and rooms of Correct Alexanda Tables. made in accordance with suverament specifications mare available for entire mounts, wine errors funding gent and other aircraft manufacturios purposes. An inquiry will being angelife information.

NATIONAL TUBE COMPANY



DOW CORNING first in silicones

is fully equipped with new plant and facilities for be production and distribution of an expanding line of silicone products

American industry has been quick to utilize the new Dow Coming Silicones to doe the potentialities unberent in their higher coder of heat stability, chemical inertness, water resistance, and dielectric properties. Dow Corning is now supplying, directly or through selected distributors, the following allicone products.

Weter-white odorless boot Shoon Lioutide setable for their low rate of viacousty change over a wide temperatue range, low vapor pressure, water repullency.

such as arbestos, meca, and Fiberalas cicil tope, and sleeving. Other special person STORCOCK GREASE A chemically regutant Silicane

Iguiton Sealing Compound . . . em easily applied silicone waterproofing compound having excellent delegate properties, corong resistance, and the numberory of naterilanes tally. It naither borders ser meits at temperatures ranging from - 40° F

and other around close scients.

Special Low Temperature Compound . . . en exidation renetant lubricant and realize compound developed for nee at temperatures as low as - 70° F. A Inbrigation Streets Greens for special applications in the temperatere range of -70° F. to 190° F.

MIDLAND, MICHIGAN

PLUG COCK GREASE A Silicone Grease that affects carr operation of lubricated play value over wide temperature ranges in most diffi-

Sandaton Variable second

heat stability for impregnat

the coating and bending, and

Grease for inherication stoneseks

A behricotten Silicone George for medial opplications where operating temperatures range from 0° F. to 400° F. CORNING CORPORATION -----







CUTTING-OFF by abresive wheels is the modern way of speeding up operations and lowering cuttingsoff easts. Norton provides complete cut-off wheel service-resinoid. rubber, end shellec bonds; Alundum. Crystolon

Because Norton engineers have a variety of hands and types of abresives to work with they cen give unprejudiced essistence on ell types of cutting off and slotting jobs metallic or non-metallic meterials by dry, wet or submerged mathada

and diamond obresives.

NORTON COMPANY . Worrester & Mess.



THIN SECTION BALL BEARINGS solve unique problems

Could the advantages of fricviceless operation of half bear ings be applied so rudder and eleveror rooms, so control colwar and other applications where motion was oscillatory

This reservices by aircraft dein of this section bull boarings by Estale engineers. The cessir was a bearing which brought mery depote and half also lean proper relationship for safe

fearticeles under normal dis-The Estate B300 Series of Thin Section Ball Bearings are applications in protected areas

For applications on exposed

the B 500 Series. They follow the design and are available in eight hore sives from 1 3130° ro Corolog showing all details is excitable man rement. The

surfaces Palmir K.B Series is rec-

mison playing and greate this ide

Palnir Bearing Company, New



"IATION , April, 1843 AVIATION, AND 16

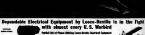


CLEVELAND 16, OHI

rriex, april real

DEPENDABILITY For more than 20 years Codens outsmars have had reason to also thely feith in the fidelity of Corlege products. Today in the se of the ormed forces. Corlege controls are used on the THURIDISCO. the CORSAIR, and the CURTES COMMANDO ... provide perfect performance, or demonstration of other clans OSCAR F. CARLSON COMPANY

MEAILTE TEECE-







AVIATION, 49%

STATION, April, 1948

S, INC. SOUTHERIDGE, MASSACI

Movies at 60° Below Zero!



Still and CAMERAS JEROME

28 Ways to Use JERONE CAMERAS

the elibertee totalise of the "cold boom, afters 40, police were respectative is mulcassed. To maintain a permanent record of the seen, a 1880000 beld and Morion Piczur Camers is used. Briefe, the SEROMS Causes will operate at minus 60° Z. et all erecia, met en se ordenere remem will fencies under account recommence emplicions. For this purpose houses becomes and micry from an annualled in such comes. These server benefits the less solognesses in breeze we serve charter. Their our termin de presente of USCOME Communication both in cold rooms and in flying service men where low sub-

ENGINEERING CO. JEROME

Manufacturers of Mation Picture and Special Data Comergs

For Utmost Dependability ... WITTER Aviation HOSE CLAMPS

spendability has been recognized by the Winsk Manufacturing Company during its 23 years of hose clemp manufacturing experience as a foremost requirement to any bose classo design. Wittel assures this derendebility by the selection of hauselfa sound designs ... the use of high-grade meterials and the application of good werkmanship, Today Winek offers two Merlecity different hose clamp designseach of which meet the requirements of Specification ANJES-C-406 A TYPE WWD -- an adjustable worm drive been clamp made of mainless seed and designed

to take full advantage of the consider plan sical properties of ther massriel. Note the compact recombined bossing . . . the hardened one piece themberry-PLUS a new exchasive Wittek feature-un inner hand of Stainless Seed secomplishing the two fold purpose: (1) protecting the hose from the secrations in the owner band, and (2) distributing the food selformally to provide greater streagth and superior sestion characteristics.

TYPE PESS-an improved Stateless Steel version of Wester's basic FD design-now incorporating a bridge extender-in all since. This is the mass effective horse clares. for all ambierrous where an adjustable

Hose Clamps for all requirements, made by Wirek-specialists in hose clamps and





In the second second second second

is the word for Doak!



When aircraft parts or assemblies are turned over to Dook for manufacture, the entire production job is done right here. For the Doak plant is a complece, self-coorsided metal-working factory with all occessary processing departments. A "plus factor" at Doak is the lone background of our key personnel in aviation...all of whom have at least 15 years experience in

sircraft production. The result of these specialized facilities and "knowe how" has been a source of keen satisfaction to the prime contractors we serve in the maintenance of volume quality-production on schedule and in the development of many cost-curring production short curs. Dock Aircraft Company, Inc. Torrance,

AVIATION, AND

*** -

marchia marcia fabrica mondo na monocalata a

Corter Nesch Assessions and in new machine . . . produces

and appearing print, with and between the absets, and a eath ioint. Outwending frain joines, and the shiller so

mirrorieum Machines ann www.gooflebile



MORRISON

MARKING SEYROLD-POTTER CO.

ATT WARRENCE ST DANSEN BY COM-Please and me your Bulletin A-41 giving complex into

STITCHERS

MANUFACTURERS OF COMPLETE AIRCRAFT



performance

Another Electrol "first" -- the new Selector Valve \$281 for Auto-

ELECTROL'S SELECTOR VALVE FOR AUTOMATIC PILOT

matic Pilot. This highly efficient valve is a triumph in slide valve design. Weighing only 22 ons., it is a unique on-off Selector with a self-contained bleed for the discharge of all air from the pilot hydraulic system. Although barely out of its cradle. Two Elichty-one is being adopted by the Armed Forces in ever increasing quantities. Write

FIECTROL

5 MEN would strain and tog to move this load that's being hauled with case by this I operator and his Greecest NTW Tructor, And while the erme 5 men were making one trip, this follow can make orveral. Figure it out . . . and the answer is that electric materials handling with Crescent pave for itself over and over again . . . year after year . . . in my

The Greecess NTW Tractor is stored as an or pary to handle as a hitten. Twin accorder wheel construction permits operation is congented areas and narrow sinks. The NTS is the deal all corroose tractor for warehouse, still, railmed and dock service. Get the facts about the Wester and the entire Crearent line. Write tules for free natalog ... or burling your materials

ings of manpower and speed of handling. Put handling conditions for specific recommunications TI20 WIRAW St., LERANON, PA.

ELECTRIC

AVIATION AND IS



The Automotic Electric Catalan when full datade, With far your same.

To SPACE requirements distance a small rela--and service conditions a powerful one . . . here's the relay to fit your needs. It's the Automatic Steerie Class "S" Referenting in size light in weight, but dependable and packed with power.

Class "5" Relays have been designed especially to meet the exacting conditions of service on fast, modern aircraft. They offer a combination of features never before found on any relay, large or small. For evample:

withstead with a longs mergin of sefety the ment 2. A unique spring destan provides bigh control pressure within small space limits.

2. An added assurance of reliability is provided by 4. The new type of plauphysical armeters with full The new type of piniphreled ermeters with full length bearing provides the Class "5" Reley with exceptionally leng life even under the

BONDED

the new bond that gives

cision finishes unned of before -

es sa accurate that can measure them when inches with a

Write for Catalog Sixting off Chicago products and slowing comparative photographs of finishes with different block of Wheels

CHICAGO WHEEL & MFG. CO. 1101 W. Manroe St., Deat. An Chicago F. Hinain

> * New o Control of Specialization has associated our Superistion as the Small Wheat Popple of the

TRY ONE FREE Mark wood, without sharps a Manufact Wheat

striken proofs befor in double subd if HECASO GENERAL WAS white remaps of greater and genetic post-short CHICAGO MOUNTED W

The first work and the form when the constee of bands, obviolens and alonger to bandle

and Cooling. Interpreted in | Monated Wheels | Grinding Wheels

AVIATION, April 204

These are postwar pictures



Pictures taken during this war prove many facts that can be applied after the war. One of these facts proved by pictures of drums that have travelled thonsands of miles under the severest conditions without loss or damage to their contents - is that a product is absolutely safe in a dram equipped with Tri-Sure Closures ... as asfe when stored in the open as it is indoors ... as safe in a storm as it is in dry weather . . . as safe when shipped across the world as it is on a short haul.

Only Trickers's and, abor and Ampres on give draws the excha-

tops at the specified persone, impore Yornometers are widely used in aviation, and a other fields where precision in assembly and mainwhere is essential to efficient performance. Toroween an available in a full range of sizes from reco STATION April 1945

Exactly Right ... to 30 in the up to 2,000 ft. the Tapacouriers are

In many assembly and majerrance energious, aretiming seeds and bolts execute right is critically im-Peter. Discortion cannot by inaccurate tensioning were power, promotes wear and is a frequent coase

of mechanical faiture. With Soup-on Torquencurs even inexperienced workre milities and confidently tension bolts to the correct broggand . . . and on delicate mechanisms to the error inh yeared. As the worker parms the next be zeen the besies increase - on the easily read deal . . . and

fully described in the new Sasp-on carsleg of 3,000 modern hand and power tools. Write for your copy, SNAP-ON TOOLS CORPORATION 0000-0 200 AVENUE



AMERICAN PLANCE & MANUFACTURING CO. INC., 30 ROCKEPELLER PLAZA. NEW YORK 36, N. J. VALSEIGE PRODUCT'S LIMITED, ST. CATHABINES, ONVARIO, CANADA AVIATION, and Po



America's leading alcraft makers have learned from experience that they can depend on the highest quality of precision assunfacture in Sydraulic Research produces. As a result, during the past few years, we have turned out thousands of hydraulic devices for the nation's passe builders—everyone of them a precision product—everyone in keeping with energing of the product of the past of the past of the past of the past of the product of the past o

HYDRAULIC RESEARCH

AND MANUFACTURING CO.

AVIATION, AND THE STATION, AND 1945

when you mink of BETTER LATHES the only lothe which ombines of these SIX FEATURES SPECIFICATION These six fectures odd up to precision performance, high speed preduction, long lathe life and wave safety for the operator, They esplain why the name Logan stands for SETTER Lottes in every field of industry. See your Loans Lathe dealer or write for entains letter. wellow an oil workels of Larges Lether. LOGAN ENGINEERING CO. Chienna 30 Illinois

Think of saving 90% on revision of drawings!

POTTER & JOHNSTON does it with

PORTAGRAPH vacuum-scal printer



peractly what the Potter is Johnson Machine Co. of Pawtucket, R. I. respect when they matelled the to the engineering renferous today the drafting man consume with war-reduced manpower "Some of our machine track montes 80 to 90 hours' decem-

at stee Harnid R. Soule & sistant Charf II regimes: "The for correlate tructure Portners reduced this operation to 4 or hours, stepping up production i Dates the 49" x 69" Vacuum-des Portagraph, available also to "size - Potter & Johnson great time-saving. Eliminated week the barr-consuming checking is

reproduction of ink-like phot copies of anything written, prints or drawn. "It's surprising". Mr. Soule save. "bow much clean Postograph conies are then the worn tracions tomospoming them into featherweight paper position for blue printing by means of Ports graph reverse negatives."

SPEED - VERSATILITY - SIMPLICITY - ECONOM PEMINGTON BAND





FREE-A helpful 20-page book of practical suggestions - "How to

Reduce Manual Tracing, Drawing and Copying". Ask our nearest Branch Office for a copy.

HOTOGRAPHIC RECORDS DIVISION, REMINGTON RAND, BUFFALO S, N. T. STATION April, 1645



THIS RED LIGHT SAYS "STOP!" TO ENGINE FIRES

It glows on the instrument panel, warninto operation . . . and the Fire-Extining the piles of the first trace of an enring enishing System itself, which clarges a fee. It's the signal, not for a betl-out to dendly many of realism districts wound the cocane a flaming wreck - but merely for corries ... to kill the fire

cater Panel that fleshes the warn.

ing signal . . . the Control Panel

that unto the fire-fielding system

an easy pull on a convenient handle. In a And they're all developments of Kidde matter of seronds, the fire is out! Simple, isn't jt? Behind this simplicity They're typical of the many ways in First, there's the Flanc Detector that which Kidds skill, applied to gases underspote the fire . . , then, the Indi-

pressure, is setting new standards of sefety for America's combat planes today-and for commercial and private fixing topograms

The word "Kidde" and the Kidde and are irrele-marks of Walter Kidde & Company, Inc.

T Kidde St Company, Inc. . 140 Coder Street . New York b. N. Y.



Like the converse this muchine has no ideas of its own. But therein lies its trempodous value to man production industry. It is one of Alliad's duplication machinesfrom her rum foor Kallier Brown a magner model. It is exclibbe and exactly reproducing a propeller blade form in a piece of steel. And the copy will soon be surning our reamberless, featcless simpless propelliers as paintents instr. on defile and as precisely alike as could a thousand skilfed craftumen workens a thousand times longer. This emazine Keller "conv-cur", one of Allied's eight terbication machines costine well over a quarter of a million dellars. (Descretes Allard's reduce of combining

which has made Allied a standard source of supply for

time expension, Allied is equipped and stafed to air a greater range of service than ever. Asticipen you portwar requirements and check with Allied now. be Managines the estimates on mains and

to the smallerti, E.B. insterchangeable punches and der, and

the finest of mechanical equipment with the maximum in skill and experience. It is this rigid adherence to an ideal of quality in both equipment and craftsmanship

TITE AN ALUED PRODUCT . . . Allied Products Coppered Hallodale, Michegan, make sheet metal den (from the hore

AVIATION, AND

heard plant; molds, has and farmen, special production

AEROLOG-A Directory of Plane, Engine and Propeller Parts STECK COMPANY AUSTIN. TEXAS

In Every Airport and Flying Field in the U. S. A., CANADA and MEXICO AEROLOG

WHERE CAN WE REPLACE THESE BROKEN PARTES THEY MIIST HAVE WHERE CLOSE BY

Will Have the Answer on PLANE ENGINE and PROPELLER PARTS Aerolog is not a magazine or catalog: causes an display OF PLANE, ENGINE AND PROPELLER PARTS It will contain photographs, beste date end perts deputage: complete purts lists and ordering information; complete list of official distributors of yours for all pleases, excluse and propellers described in Asselse.

Now, every cirpert and flying field operator in the U. S. A., County and Mayles con colebby locate the nemest distribu-

FOR SPACE PATES RESERVATIONS AND COURSELS INCORMATION ADDRESS

many mane-production industries. And because of war-



lightest pressure is all you need to set the scales at the angle you want, anywhere on the drawing board. Your right hand is always free. For the full story of PARAGON features, convenience and handsome modern appearance, write on your letterhead to Keuffel & Euser Co., Hoboken, N. I.

KEUFFEL & ESSER CO.

Pales Messages Tax

CHICAGO - DETEOIT - ST. LOUIS - HEW YORK - HOLOKEN - SAMPEANCISCO - LOS ANGELES - MONTH AVIATION, AND MAGNETIC CONTACTORS GUARDIAN...

Built to Army and Navy Specifications - Sighter weight ... and more efficient performance. These are the chief advantages of Chieffen Meganite Contectors. The types shows below are now being used to Array A Perry mercell shouth for control of starting motion, book buy door, loading but was floor, erc. Step one tested to conside in all publish under necessary over inn times greatly of offstydes up to 50,000 feet and under aniverses of leaperships on

ten more group of consists up to SULUD had and under mirrors of image-plans and benefity. All moving parts are entired and protected from dail and injury. Butto unit-may be discombied with only a sexwelling and plans. Herefore quantity when writing for delicer and delicery between A.A.F. TYPE S.A Jess Me. 94-32324 Unescelly light in weight, this type

of 2.4 with the numbers which ten a double wound call out n designed for restment duty. der refreg 200 amps, resilience - Voltages 24 softs SrC. - Mail authors schape 15 softs SrC - Warper, 644 St. A-A-F. TYPE E-S-E

leader contests, rained at 30 am was and amplicity in dealer make the Egitted of magnetic end when, Contacts will bondle surrout week in account of 2000 annature gred for continuous duty. abot rates. 50 emps. continuous - Voltage: 24 mile (C. - Mile Weight (195 ft) A.A.P. TYPE 8-4-8

A.A.F. TYPE 8-7-8 se two frees are essentially the same or the flui ascent for and emerious bracket. They differ mb. S.4.5 hor 'A' becaled early S.7.5 hor M' and

Statistics 100 maps restaure - Yologo 24 vals S.C. - Addison that relegan 18 vals S.C. - Waight N.C. & C.42 a. 16.7 a) 6.45 b A.A.F. TYPE D.E pulledly designed for or what duty is segion starter th A. str. Contacts withstood co of ares, as in 1999 suppose ages, angular Col quels on

#2 with company a maximum of 4 amperor at 24 with D.C.

intel ratios 200 sept. continues - Yuhape 24 with D.C. - Mile-tel effect ratings: 7 with D.C. - Walphi G.F Br

N.A.E. TYPE 1204-1 Spec. He M. Selve Complex No. Co. Serve the seatest and Sebbest of the

tener with contacts rated at 50 measure Coll from 220 milliones at 24 web frees out when voltage has been reduced Contact telling: 30 maps, confessors : Voltage range: 18-29 with D.C. Wilson, 0.33 S.

M.A.E. TYRE 1204-2 Another confessor skily contactor designed Herry medications with sectors retail

of 100 emperes confineds. age is 14 with D.C. setting with one is 14 with D.C. setting with Content ratings 30 emps. continuous - Vallage range: 10:25 valls in C N.A.P. TYPE 1204-2

Hes a double wound sell stroving 2.2 coperes on affront at 18 with and 220 milliones when now other reside cuts in a higher resid ears. Designed for confessors duty Contact ration 200 arms, confusion a Yolkson conce. \$8.28 with th.C.

For wheelth mater exected in gas farreds, mater break SFST double break SF, a

PLAZEON, APRIL 1945



KEEP BUILING WAS BONDS

Delco Radio GENERAL MOTORS

AVIATION, M

WHERE ACCURACY COUNTS

Wet Seat Grinding IN-LINE and RADIAL

Aircraft Motors



AIRCRAFT Wet Valve Seat GRIMDING MACHINE IN-LINE and RADIAL MOTORS

STANDARD THE

TATION, April, 1945

How many Aviation Buyers do you see in this picture?



various services in team buguing. Not one, or two, but all A four functions of the industry evert their purchasing Manufacturing . . . Operation . . . Maintenance . . . and For these four functions are closely related and later. december. So closely, in Sect. that it is almost impersible to see when one store and the other starts (Consultry and nance carrot function unless erared together effi-

uty. And their requirements are the requirements of educat aviation marketing this cettern recents itself To ignore it in to do less than a complete selling job. To reconstrate on maintenance alone in to corridale the means. for being of majetenance. To concentrate on the manufacturing market alone is to forget that the mamefacturer serves the other functions. It is equally dangerous to conme your sales effort to operations or to distribution. That is the "why" of Aventure editorial policy main-

distributors and fixed base operators who are today laying the properturely for an expansion posture plant make. turied converges of an adequate authority. To you it means foundation market consense. It men that each month your advertisance is assured of reading 42,000 paid subscribers who represent all the leaving union of excetoos AVIATION -- AVIATION MINES -- AIR TRANSPORT McGraw-Statt Publishing Co., 50e West 406 St. Dev York N.



AVIATION, AND SUITONS, April, 1945.



YOU'LL HAVE TO WATCH YOUR PENNIES

IN THE PEACETIME COMPETITION With the coming of peace and a return to the American

way of producing goods at a profit in highly competitive consumer markets you'll have to be certain that every step from initial blueprint and tool denge, through the machining, stamping and assembly line, up to packaging and delivery is planned and executed with utmost efficiency and with the minimum of cost.

In the production of war munitions Odjak has maintained on enviable record of production of intricate parts and on time delivertee, in accordance with strict Government inspection-and has actually reduced the estimated and approved cost, thus saving the Government considerable sums, by skillful planning and supervision of the work. These same skills in metal manufacturing, improving designs and reducing costs are available to manufacturers as they convert to peacetime merchandise. It may transmit your penny savings into dollar profits to confer with us on

any metal manufacturing problem WELDING - PLATING - PINISHING - ASSEMBLING

THE OILJAK MANUFACTURING CO., INC. THE JOE COMPLETE FROM BLUEFRINT TO FINISHED PRODUCT -



USED FOR PRODUCTION TESTING OF AIRPLANF FINGING HARMESUS THE ONLY MACHINE OF ITS TYPE AVAILABLE

H will be training bear done allocabilities and and the harness shield grounded, storting with zero voltage on each lead and increasing smoothly and suremerically to the specified test voltage, which is hald for the specified time interest. The voltage is then not off and the markon advances to the cost lead where the test sequence storts again. This cycle continues until all leads have been high-powerful tested. After the high naturalist test, the markets is charged subjection much be a fore-notestial connect test to eleter. mine the continuity of the copper and to check outcmericulty the correctness of each connection between the smark where and the mannets connector place. tered, the test procedure comes and a lamp and

become found about to assembled the foundation of which particular lead has failed is given by an arrow pointing to the local number.

If a bushes or incorrect connection is located defen the sequence test, the test senses and a lawp and be signal is given.

All feult detection partions of the circuit are in dulfents so that a failure of any portion of such dend out The maximum test velture which can be funished

is optional up to 50,000 volts, 40 sycles, or any other freezance. Not a single harmon that has been tested on a JLE Tester has ever falled electrically in service on a plane

For additional information, write to 45 Church Street, Postpolar, P. L.

JAMES L. ENTWISTLE CO

ANOTHER Interstate ORIGINAL

Four outstanding features: (1) Plexibility . of installation Become this Volume is also trically operated it is subject to remote control and one therefore he installed where most convenient. (2) Efficient operotion. Delivers high holding power on low amperage. Actuated by a constant duty solenoid of dual winding type (3) Con be designed for high flow (GPM)

WAY SELECTOR VALVE ELECTRICALLY OPERATED without increasing load on salenaid-

because this Volve is a balanced papert tune. The Volve or designed can be used for pressures on to and including 2,000 p.s.i. (4) Low voltage. The Valve operotes on 18 to 28 volts (Aircroft) but, with A for 110 volts, AC. For more detailed information write Sales Department-

AVEATION, April " STATION, April, 1005

MERSTATE AIRCRAFT AND ENGINEERING CORPORATION - EL SEGUNDO, CALIFORNIA



So it won't get caught with its PANTS DOWN

B-29s SWITCH TO CORNELIUS AIR SYSTEMS FOR FASTER OPERATION OF BOMB BAY DOORS!

course mann boomb hows were covery fighters that fant. Otherwise the few will try hard for a bill, bronsing the his Bosins R.19 won't try evasive action until the That's why it is important news that bomb have on D-29s now open 15 times faster, using a rewiy

adopted source of Nebsweight stored energy . . Cuts Time From 15 Seconds to Vis of One Second These trim little units are more 10-lb headfuls, yat sting-dangered pneumatic bomb door mechanism. Deeps now area open in 7 of one second instead of

the 15 accords formerly required. This means fester bomb runs, easier "tracking" by bembeight, and a AME FOR PETALLS about other new applications of the Cornelles





THE CORNELIUS COMPANY 1621 E. Hennspin Bro., Minneagety 10, Mire.



FOR SEX YEARS, place passengers fortuness enough to ride in comfoundle "II 5" Kealon Form cublemed seen have errived er their destinations rested, refreshed-always willing to declare the sain seemed to take over less time than it did. For the same six years-half of them under the errors of war. rime conditions—air line operators formaste enough to here equipped their frees with "U.S." Koyloo Foam, found cushion majorenance requirements amazingly reduced—require and renova-

tion needs very rare, complete unit replacement almost unknown. When it is once more the time to merchandise your air travel facilities, conveniences and comform, "D.S." Korlon Form will be back from serving war end medical purposes exclusively. So make a date with variety now to see to it that specifications for the planes you will add to your feet, the present once you will modernise and those that will be converted for you, include "U.S." Keylon Four custioning and bedding.

tions on Thomas America Represent Commerciation of wide for the The second of favorers in Philosophic London

Serving Through Science 1930 BETH AVENUE - SOCKEPELLES CENTRS - MEW 1005 26 K

Scientific Control Insures 1111 S T Kaulon Foam Quality

181 S. T. Womber, Steam continuing wellmonally outlants the design of the some is is used on. This endurance is dee to rigid laboratory and production controls which secret on married or human variables on effect its makene. Kontro medics renner consumently eniform, year in, year on.

COMPANY





important industrialists appealed to as for a sew that would cut aluminum and

serving and faishing of every material. The Bettress went right to work in plants seeking posts for plants, which P.T. books motors, icons, trucks, ormoments. Lost commer it was referred by the War

he performence and you like of the Dated Butters which receives an exchargering, but does continuous, good work and worm out They sens't hadisen the time spoud by the Buttress when sow. pleatics, leminates, plywood and lumber. To consince yourself, order a try-out band today fundable at all any secolu

points Massion the meterial new home to cut and you'll get the proper pick and width saw Write for Streeters about the Dadit, Bullions





The DealL Company

AVIATION, April 30 MINTION, April 2945

Shrinking Time and Distance

Superstere Today's Connat....

Redominate of basic aircraft and engine design continues to create new records in the air. U. S. Super-Pasitives are the product of a rigid quality policy . . . to exceed wherever possible the reservements of the most exaction.

> U. S. Super-Passive Piston Rings, produced in quantity for war, will continue to help set new reandards of stiphane and engine performance... of power and speed... to shrink time and distance in the commence of news-

SPEED THE DAY-BUY VICTORY BONDS: for the Continued training train Professional

U. S. HAMMERED PISTON RING CO., INC.



BUT THERE IS A WHALE OF A "DIFFERENCE" IN

They may feels effice whether may be identical, but we one of UPTITES complete line of reliable model fields explice contex on invalidable ingression founds must the "Ofference" in the Integrity of the manua (Multi and the years of expensions and "intere how" of UPTITES explosure and abstractables.

Clinic configuration services for each highly intered by

Only continuing service by such highly beload sicious cut keep year moral finishing operation or smeethly. This is the "difference" in LOTUIT secular transition. This is not in the largest LOTUIT and less transition.



AVIATION APE TO

Aireon



The cornerstones

Write old hands at basic ouglineering. From the time we were small fly, it's hoest our practice to conduct our own research—by our own occurencessure. It's a practice that's hoest unusual engineering telent,

It's practice that's local numeal originaries placing labels to the development of autonomously good optimization. "This laborest sense of responsibility is required to a solid part of the context of the context force and many of the country's major addition. And resumming the factors has deverse a solid growth core like right years of operation. "A diverse example to the context of the country's major addition. And resum growth to the context of the country's major addition. And resume maps high growth core like right years of operation. A diverse example to the context of the contex

MANUFACTURING CORPORATION

Your peature plane into finished products. Glad to
finish access of accessors talk it over whenever you say.

Sade and Bendmick - Engineer Privar Controls.

NEW YORK - CHICAGO - KANSAS CITY - BURBANK PERTON April 1945





Ohmise Rheosests have long been standard on aircraft. Today, these new AN3155 units provide new improved control protection and other new features. They assure smooth, close, dependable control ender every service condition of heat, cold, humidiry, altitude, shork and

Made in 25 watt and 50 watt sizes-linear or upor wire-wound-in various resistances-with "officesition" as required by the specification. Totally enclosed in weight than the allowable weight specified. Write for desails.

OHMITE MANUFACTURING COMPANY 4944 FLOURNAY STREET . CHICAGO AA HUMON

Be Right with OHMITE

vibratio-



Every MANUFACTURING

CUSTOMER **Will Benefit**

Industrial users of WILCO Produ ucts will find the increased facil-Ities, the new products and techniques developed by WILCO for war service of great advantage to their own postwar products

As the Herryton indicates coming of prace, many WILCO products now making for precision performance in simplesses, ships, tanks, guns and instru-ments of the Army and Navy will play an acquality incontant role in mostless civilian

seeds for bundreds of useful and reliable The demand of all bearches of the serv-Contacts has motivated many WILCO dereicoments of great potential value to peel

war ledostry. New products added to an already extensive line; recreased facilities for reflering and fabricating precious metals create extended relling mill facilities was new additions and impro now devoted acincinally to the war effect. will prove equally helpful to menufactur ing customers in seeding their peacetime orfine and marketing problems WILCO PRODUCTS ARE: Contacts. Silver, Platinum, Tungsten, Alle tered Pearder Metal, Thermostatic High and Low Temperature with new righ temperature deflection rates. Pro-

four Cled Steel for bearings, shims, rectors. Jacksted wire. Silver on THE R A WILLIAM COMPANY 105 Chestant Street, Newark 5, New Jersey Brunches: Datroit . Chicago

Thermometala-Blactrical Contests Procless Metal Simotellic Products "PITTSBURGH" DEVELOPMENTS IN AIRPIANT GLASS glass processing methods improve high altitude photography



THE PROBLEM .. To meet the Associa organi demand for large quantities of compre windows, for one in presuprent pieges, to enable the best profibility social common to planted the next prophetic serial common to plantedcopic season; territory with atmost depail from altitudes of ut. major and more. Tests had preved the best Plate Gless lerbed the necessary optical Place Gless techni the excessery option party model not process large party of plant m nefficient operate.

THE SOLUTION-The Pictobergh Plant Clean Company developed a right production method of practicaling and recolading tion marked at regressing and reporting and parallelism more than sufficient to man the resourcements. These remotes will down the respector and there marrer lack thekarene, und it Army photographs sirebeson, bets in abspiring information of the present testacal emportance.

T'HIS development is typical of the many "Persharah" contributions to sireling glasses. Many appropriate in sirelane design and construction have actually been made practical by new products and renewart origin As a result of its concentrated research on pared by "Firebureh." airplant classes, its unexcelled resolution If you are facing problems of sirplane glatfacilities, and long experience in quality glass one, we shall be glad to send you correlers to be manufacture, Pictuburah Plate Glass Cornrecal data Just write to Petuburgh Plate Glass Company, 2150-5 Grant Building, Parabarah

"retreauren" stands for Deality Glass and Paint



development and man production of airplane

19 Permuelyanca

MAKERS OF DUPLATE AND PLEXSEAL SAFETY GLASS AND OF MULTIPLATE BULLET PENSIONS S

AVIATION, April



Klixon Aircraft Circu



relati Mines Cornell Bernster Installations and in these wall beyon plants



Proctically away U. S. and Canadian plane that flors in every theater of creestion, in equipped with Kixon Auscraft Car-ouil Breakers These Klison Breakers provide rehable electrical circuit protection by preverting the possibility of serious Should greeny action or internal troubles sesperdire the electrical system, Khapa Breakers true-out the circuit yest before her as here out sould some Then when the trouble to remedied the rilot resetablishes the circuit for merely nucling a buffer or supposed a switch on the instrument panel Please Amoralt Consul Basekers see feelreport because hermiess transport shorts do not come numance bracks. They are un-

motion or climate Write for bulletine giving complete dimensions, ratings, and

performance characteristics.

SPIRTION, April, 1945



Teaching Natives New Tricks

This arrawant's job in India is to secure cargo in Army Transport planes. He uses Evens Sky Leader equipment, which is so simple in operation that he easily teaches its application to inex-

To every fighting front cargo planes equipped with Evans Sky Loader carry vital war supplies . . . carry them safely and undamaged and, regardless of size or weight, without risk to the plane. In the nicture e truck cheesis is being secured with

France rods and basses Since 1915, Evans engineers have specialized in loading equipment for all types of transportation on land and air. They look shead confidently to new developments in these cargo carriers of the sky and will be ready when peace comes to supply

effective tie-down equipment. Sky seats and size Sky products for gliders and nowered plane every size and shops.

The services of Evans loading engineers are the available to simplane manufacturers and sit operators in the solution of loading per

SET PROBUCTS BIVUIS COMPANY

ATTATION, AND

YOU GET ALL THESE ADVINITIONS ...

Write Today for Detailed Information

in the PULMER Honing Machine

I-Finishes cylinders faster than other method.

2-Assures highest degree of accuracy with any surface finish desired.

3-Producerstraight, round, smooth barra to working telerences m close m .0002" 4—Wide range of spindle and reciprocat-ing speeds permits boning small or large dismeters. Maximum bining capacity, 20° inside diameter. Maximum stroke, 72° 5-Oversice capacity genre and bearings permit continuous operation under heavi-

6-Simple to operate. 7-Petented Paimer Control System places all controls at "floor level," in front of machine, within easy reach of operator. 8. Percented Fulmer "Ston and Duell" System permits boning up to internal

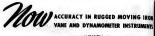
9-Exclusive Fulmer Sump System cul-10-Uses any make of conventioned hom-

C. ALLEN FULMER COMPANY

1225 First Matianal Bank Blds. Clarinant 2 Chie

V AIRCRAFT SERVICE EQUIPMENT

ONING MACHINES - PIETON RING LAPPERS - SPECIAL MACHINESY





WESTON EDECHENCY COMPENSATES INSTRUMENTS

This is earther WESTON contribution been of wer's needs, wherein the growing use of equipment operating in the higher power frequency range necessitated instru-

ments of broad flexibility plus the rupped dependability which moving iron vace and dynamometer instruments provide. And throughout industry today, the oroning use of power frequencies above 60 cycles. with the smaller transformers, higher speed motors, sempler rectifier filter systems, makes the use of these instruments essential for their dependable indications and for their economy as well. Weston is furnishing these instruments as

ammeters, violimeters, and wattmeters, in both portable and switchboard types; flat compenasted up to 1000 . . . 2000 . . . 2000 cycles for general indocatory use, as well as for specific application to electronic and power apparates. Western Electrical Instrument Corneration 515 Frelinghuysen Avenue, Newsrix S. N. L.

ATTATION, April 36



 Newest military cargo aircraft which is preolutionizing the movement of man and materials to the forms in World Was II is the Voluntabile Parket C.R. This tech-england Place, plant has been recknessed tithe fiving honor" because of its radical function and creat carrying conscien-Two horse burn-like doors at the stern permit heavy vehicles to drive in. In common with other trievels landing year craft, the CAS has a new wheel which, if uncontrolled, could shirpey violently and make lendings and take-offs extremely hazardous. Houdsills engineers "doctored" this trouble readily with the Houdsille Hydraulic Shimmy Damper which is informed by the most famous American fighters, bombon, and carry alanea. Just as the Farechild Packet will find many peacetime mea, so will Herodaille's broad agreetance in hydraulics solve many normal could have in the aviation, automotive and railroad fields.

> HOUDE ENGINEERING DIVISION OF HOUDAILLE-HERSHEY CORPORATION

MAKERS OF MYDRAULIC CONTROLS. Buffale 11 New York

MANUFACTURERS OF PRECISION PARTS AND EQUIPMENT FOR THE AUTOMOTIVE... AIRCRAFT . BAILWAY ... MARITIME ... ELECTRIC REFRIGERATION ... RADIO AND OTHER INDUSTRIES

STATION, April, 2845



Das have you conclooked the fact the

You have the receivery of uniform accuracy ... with an envilore. Your



became & makes the bird of market that argosps and decoprops actory and





go firesphert aliminate ments use of searchalf the property of





Flanged Bearings





to your Specifications Designers of equipment and machinery often and that the addition of a flavore to an otherwise



plain alseve bearing not only solves the publish of end thrust but likewise suspidies the tesk of correctly locating the bearing in assembly, Johnson Bronse can supply flanged bearings of any type . . . in any size . . . to your most exacting specifications. This includes flances on one and or both ands . . . in the center or off-center made from cast bronze-in any alloy . . . bronze

and babbitt . . . steel and babbitt . . . or LedgloyL The essient most satisfactory method of determines whether you can use flanged bearings to edventage us to call in a lebrace Engineer Permit him to review your applications . . . to study the operating conditions. He will been his recommendation on Jacts, free from preva

dice. There is one located as year as your phone ... Why not consult with hom TODAY? DISTRICT SALES OFFICES. Atlante - Boston - Builds - Chicago - Continuet - Chemical - Delice Detroit Kassas City Lee Angeles Honnespole Newark New Coatle How York Philadelphia Printerph St Louis San Francesco South

AVIATION, April, 196



WETORDRY Safety Walk on Winas and Walkways The best quarantee of freedom from lajories named by slips and falls arroad abstract is a distanced when well of WETORDRY

Cafety Wall. During wet or low weather presumen enter and leave planes more swiftly and surely and pround man do their maintenance work with greater speed and assurance on skid-proof WETORDRY Safety Well.





When the man who do and electric drills day efter day says "Clark's my choice, box" -cire him a Clark!

Naturally, he wants the helf . . the easiest to handle . . . the nest dependable drif evaluation

And, his assertance is an impotest verdetick when purchasing Give him a better drill and hell produce better werk . . .



AVIATION, AND



SAYS "WHOA" TO THE KING COBRA ...

cetaotapeous, dependable power.



Each landless is a case of wine flane descu in time . . . or else! Flick e switch, and instantly the United States Time Corporation, wine flags obey this little U. S. Time estuator. With the second of a cohere's Scholder Corpor, 630 Fifth Awenra's etrike, it leaps to 10,000 rpm . . . de-

a bic a manufactural full order to the second livers 1/6 H.P. smoothly, reliably. percision built by U. S. Time. But it This ministers power plant is one has to be inhumerable-over with of very many U. S. Time precious products used in most of our planes, bands simplified one often the bir warshing and monitions. of our fast and furious King Cobes. World's largest reporting wards fighter. There's no room to store. makers the largest precision is etrospent makers in our industry

11. S. Time will soon be made to mass-produce precision products at low prices for postpoor planes. We would like to be of server

Che United States Time Corporation The Asser-Nerv E flore have little expeded to both

our plants at Waterbury and Middlebury, Connecticut



Charged with PLUS-FIFTY DUGAS Dev Chemical This is feet-action restaction that is YOUR setsoured applicat fire ioss when you own a

DUGAS EXTINGUISHER. READY FOR ACTION ... Deges units are mobile, cary to handle and simple to operate. They never freeze up in winter; never remains periodic recharge ... per can be quickly recharged

on the stor. SAFE... the dry chemical rolls up a hear-shielding acreen for the operator and at the same time chokes the fee . . . it is non-

male non-correction non-abrarian and is not an electrical FOR EXTRA-HAZARDOUS PIRES... in flammable libraids. solids and gases, and in electrical





when deliver

quick delivery on a and our machine tion. Ask us to belo ron-no obligacion eging to be more

See your Canadian in Seconds HAPPAU MUOL mandate in Cold-Purple

128 Clay Street rooktro 22, N. Y.



MEVEN FLIGHTS A DAY

Winging from bases on the Atlantic coast, eleven flights a day head sastward toward Europe. Transocean transport is carrying urgent sarge and military personages back and forth in a shuttle service that is no longer a rosy dream but a reality, presoning peacetime air transport of huge proportions. Contributing to these flights is Delco-Remy electrical equipment. Today thousands of transports. bembers and pursuit ships have Delco-Remy electrical units, precision parts and products made expressly for the aircraft industry. The engineering and research development that has been opplied to this production will find a place in Delco-Remy equip-





tor Uphoistery of the tuture... that does not support combustion

The difference of "U.S." Flame proof Naurahyde is that it looks no different after and pliant, it has a gristle-like toughness for high resistance to edgewear, scuffing,

shrasion, wrinkling. Disinfectants and insecticides do not affect "U. S." Flame, server Naugshyde and the surface weekes clean with simple soon and water. Flame-proof Nameshyde dress not support combustion

UNITED STATES RURRER COMPANY COATED FABRICS DIVISION . Mishewake, Indiana Serving Through Science







Sales Officers

Stafferin Cheege

Printerph Sudenter, N. Y.

The recently empounded Fairchild Packet C-82, andy called the "Bring house." is a versatile carrier that can quickly load and take off with 18,000 pounds of trucks, troops or other cargo. That, we all know is no small achievement.

When the C-02's designers totaled the weights and found they had more than 12 tone deed load on each wheel they called on Summerill to produce the special steel taking for the mean logs of the lending over. We're proud to say that we did it!

Aircraft engineers and designers have always turned to Summerill for searches steel accords and mechanical tubing. In recent years, however, we have been called upon more and more to produce many special items including large structural "squares," this wall sections and tapered, awedged and upset parts. Why not discuss your taking problems with a representative from the nearest sales office? It is more than 22 selv that he can halo won

SUMMERILL TURING COMPANY BRIDGEPORT . MONTGOMERY COUNTY . PANNA

Lines as "Some Loke Farend" - we prove of talls by the good accounts of dentities at the Michaelman Sompton Season, CHI release, Landon observes, and it is a set E.W.Y. ATTATION, April 1



EVEN such they segment gears as the one

stroying the enemy.

curate in operation if some covenital war

machine is not to falter in its mission of de-

Telair accuracy means absolutely uniform

precision, tolerance and concentration in

MENT & VICTORY-

Rookler Brain Yeles Steem Proper Type Industry Kodine Annual Two Facilities "Quee and Clears," July

ties easters and being dear types of norths Let up hade you adopt the Knobby Proper Valve principle to your design. It has proved

SOP BASY DRAINING OF OIL . PUPL . COOLANTS

1 Desiries Of Sec. Series 2. Replaces "Y" Type OI froit

- 3. Breining Oil Same Teals 4. Dreinley Peel Tooks
- every machining and finishing operation. It is this kind of precision engineering and workmanship which we are patting into intricate bomb fuses and hundreds of vital com-5. Braining Continu Content ponent parts for the war effort.

Name We Are Not Interested in Oast Park War Fredricks We Are Only Interested in Whening the Wall. THE TELEOPTIC COMMAND

PRODUCTS COMPANY

414 Yearnest Arm. DAYTON & COST The same of the same of the same of the same of

Newest KOEHLER DRAIN VALVE EASILY ADAPTED VOLID DESIGN





CLEANS ALUMINUM PARIDIY AND More EFFICIENTLY

Manufacturers unless DEGYIDINE have found that cleaned showless markets are adquartely prepared to retain a lasting protective paint fields without other presences. Arm thin costing of abstractum phosphase which remains on the surface sends to prosect the abordown and relements naint adhesion It has been established that the deep eaching produced by some former aluminum eleming

methods is unscensor and undesirable -- also that DECKIDINE chiminates the danger from alkali and other injurious residues frequently regulations and quartically impossible DECKIDING may be used so a spear or dip or, for some applications, applied by brush.

By the use of Deoxidine, economies in time and labor, as well as superior finish, have been demonstrated. Fell directions and hear methods of aredirectors for year particular one wall be about by

our Technical Department if you will write in detail to Dept. I-d.

MANAGEMENTS OF CANONITONS AND METAL WEREING CHEMICALS

Help-Man Coop Plants may address impulses and arrives for prempt delivery to Lase First, Etc., 726 East 57th St., Los Augustes, California. STATION, April, 2545

AVIATION, April 300



CURTIS AIR CYLINDERS Engineered to Your Problem Save Time - Save Labor

The unique car-demping mechanism illustrated above is operated was Carcia Air Carlinder which traces and lowers the car body. It saves time in dumping, is easily operated by one man, and speeds to material bandling for Universal-Atlas Cement Company, Hodson, N. Y. Regineered to the individual problem in a variety of applications, enganesses at the interesting protection in a variety of applications, whether a bandling, lifting, pushing, or pulling operation. Cartin Air Cylinders are stepping up production and cutting costs in hundreds of Installation cost is low and power consumption small, using regular how or when air lines. Under continuous service and beavy-dair out

ditions, Cartin Air Cylinders are giving sefuling service—the result of regged communition and simplicity of draign—only one moving part. Exceptional accuracy of control-no risk of innery dee to overloading or bad atmospheric conditions. Because of their efficiency, low maintemance costs, and long, trouble-free life, important savings in costs and in man-boart are almost neverable wherever Curtis Air Cylinders or Air Houts can be used Is will now you to write for full details and for free booklet. 'How Air Is Being Used in Your Industry.

Wrose soday.

ST. LOWIS . NEW YORK . CHICAGO . MAN PRANCISCO . PORTLAND CURTIS PNEUMATIC MACHINERY DIVISION

1991 Earter Avenue, St. Long Rt. Minerary · Picare pend ate bookier. "Haw in Feer Indexery Zeer ... Store

Scintilla "sparks" the finest X-RAY AND GAMMA-RAY PROTECTION

YOU may rely on us to sales off mobilees estendent year the use of protective series ment ... and to wantly a note. riel and method to mee If I Europe of Standards region ments. Our assessment will admit elega and marifestion m cary problem of production. testing, or general protection of management. Me abbination of

Ameng These We Street

WRITE FOR BAR-RAY CATALOG

Continental Red Seal Aircraft Engine ... ultro-reliable

* PACKARD

· JACORS

- IYCOMNO

performance for training planes. For the ultra-reliability required in the regines which power America's training planes, Continental Red Seal Engines are widely used... their fine performance sparked by Bendix-Scintilla Aircraft Ignition equipment.

ATTATION, Apr. 10 DIATION, April 164



Now-"World's Smallest Transformers" Can be Predeced to Meet Year Own Exacting Design Regelrements One of these new Permelles midset transfermer

types may be the complete pegwer to your spece or weight problem. Available enshielded, shielded er bermelicelly sealed, they provide exceptional eparating efficiency and uniform frequency respense. The same Permetter analyses, who developed

these transfermers, salar new meterials and many fastering methods, am made to assist in desiration e seit for year. Write for technical catalon Estina transfermers, sneakers, headshenes and other Permettex accustical products.

BUY WAR BONDS FOR VICTORY!

SKYDYNE SANDWICH CONSTRUCT

FOR LIGHTER, STRON

AHEDONS Domine a Stydyne allows is owner. tion and very on the 2 man to Modes, the absence of adversers or ferning alemants. Median the loader

Some many form madeled by Styles by

a month proposition of the bear of feeling material. Sense during specific tions, including complex slopes and or where are saliered with early strated made and far-nating to a ration production.

made ich Construction for navont seleand nicherns equipment. Then of it glad to discour year specify control BUILD LIGHTER PLANTS .. 100 LARGES PAYLOADS . WITH SITE Directors as record

BOOK MEN'S, HICK YOU

Detroit manufacturer of aircraft parts increases production

> They need to been one bushing our minute-ward the they had to stop and clean out left-gree abraging.

Here they finisherous 4% bushings per adoute, to mirror-smooth Satch and alone teleranees, In only one specifical Hening has been completely efficiented and so has the sently wear on plug groups county by obresive left gree from banksp. With its 800% greater expansion resen. the Lawrent Dual-Sales! Seemer Snickes many firmer the searches of bales a correctional resour door, to addition, its entires dustrated decine produces authorized fieldes to close toleraces. Personable blades may be rederposed 2 to 12 tiens, and replaced in less then a minute when were not. Sinks and infinitesi finite make it ideal for reaming amouthly over bronzers siets, split bestings str. Good delivery. Write for

> SPECIAL REALITY DESIGNATION ----· warman -- -------

EERO ACCRESIANCE

SOLD SEPARATELY

BITT POR PULL DRYAILS 5407 RESEAM DOLL . DERESDO.

ATTATION, AND DES PRINTION, AND HAS



Parts Cleaning Progress is born of experience, and is the new modern Circo "Chuef" Degresser you get the most advanced parts cleaning unit on the market — designed, engineered and belief by Circo Products Company, planeers in the market tour of parts cleaning equipment, a The modern Croc "Chief". begreaser fused with four different parts cleaning methods bound in he one self, cover the complete range of scientific, economical meta

cleaning processes —vapor cleaning (automatic), spraying (automatic) sooking and dispring a When parts are groups and green, simply place them in vapor tank and in three minutes time the pane solvent vapors deen parts thanoughly rinne and dry them Never, at any time in the wapor tank, do parts come in cornect with anything but the pure, clear solvent vapors Circo "Chief" will clean any and all types of metal parts of the appet time without any hamful efforts. Solvent is not inflamously and can be eafely used anywhere . To spray parts, merely trip foot pedal, pursp gore into action, supplying a constant pressure stream of solvers. Unique busket enables countries to heak handles over side of tank while vapor cleaning, soaking, dipping or spraying. Circo "Chief" is the most medica, festest and most economical parts

classics unit on the moster. Sund for more detailed information CIRCO PRODUCTS CO.

2835 CHESTER AVE. . CLEVELAND 14, OHIO CLEANING METHODS IN ONE







compressed are to form a negative

greene from engines and marks ery. Also can be used with the Cat Ma II.C

IMPERIAL THE CHES



ners, solvenes and most other liquid to west out-operation see al handle is released but one he loded ones or cloud. Get. He. 6-241. THE IMPERIAL BRAS

LATSON, April, 1947 AVIATION, April 18



Brad foote Gears Brad Foote precision cut gears are made PATIOS



1307 SOUTH CICERO AVE

Buy War Bonds and INDUSTRIAL and S



BECAUSE every caster in the carter. Bond has no need to offer "vorteromise" solutions. Bond recommendations are always exactly right for the job on industrial carrers permits Bord to design, engineer and

neednes carrers to cover the There's a "volume of experiance" in Bond Caming K-14because every causer listed in it was engineered by men with

breedage, Store from 4" to 12", copecition

peactical knowledge of industrial conditions Waits for it today patroling with long parries become of senneed passage you it positive crease them with the work consistent for efficient power supply to any su-close under all these continue

for Any Partiable Pewer South Read TRAD-A-F Course (filled from Stol). etherine on LODA, E" due note. transmitted by portable mile Our engineers will glothy work man many and here the

SOND FOUNDRY & MACHINE COMPANY, MANHEIM, FA.

TRUCK wit-for the Job



When military needs called for highsittude planes, supercharged engines supplied the answer. But supercharging had its problemsone of which was to get rid of the heat of compression.

At first, heavy copper intercoolers were used. Then Harrison engineers went to work. They tackled problems of weight, structural strength, resistance,

as well as heat dissipation. In Harrison's well-equipped engineering laboratories, experimental models were tested and re-tested under simulated flight conditions.

Step hy step, the eventual design was developed the Harrison aluminum intercooler which contributes to the tonflight performance of meny of our Army and Nevy fighters and bombers,

. CONTROL VALVES . . MERISON RADIATOR DIVISION OF GENERAL MOTORS, LOCKPORT, NEW YORK

NES EQUIPMEN COMPANY AVIATION, April 30 STATION, April 1845.

the Che Weter-feet

WHEN POS BULLION ME-TAL



*ACME QUALITY GIVES YOU FASIFR MACHINING SUPERIOR PERFORMANCE!

Accurate in dimension-proved in quality-Acms Permanent Mold Aluminum Castings are easier to machine, reduce the percentage of rejections, save finishing costs on every part. And even under the exceptional strain of wartime service, parts machined from Acme castings have established a record of superior performance.

For faster, sounder, lower-cost production, look into the advantages of Acme Permanent Mold Aluminum Castings today. Acme engineers will be elad to submit recommendations

Send for new 44-page, fully illustrated book, thereing how Arms is preserved and applicant --to supply your campage needs and to reader

complete service to the mentiworkung undergr.



Millions of Acro-Scale are used in places Who these ...

> APRILATED WHEN THE THE CO. milimity about a service. A lighter will have from 1900 on 1900 ARRO-SEAL Charge or for our new trans before "Account

1715 HINETSONTH AVE. BOCKPOSE SE

WORM DRIVE HOSE

CLAMPS For better factor

adaptable!



After the wer, Crown Zipper engineers will adopt -- or if necessary, create-special applications to ment special people! A lot of old-fathioned nations were encluded when Course Zenear engagement many into the field with one and tough yet eary to operate, small and design are versually anderstownikled Ther record sippers can be made that actually this treety assent sharper current They presend two or more aliders can be put on the same nipper track—to according assessmen at one But peshape the most important thing they proved in that supper designs don't here to be "from" cippens can be adapted to the sold When you turn to postwar, Crown engineers will be able to show you exactly what this record in terms of longer eiger life and entire operation on alocals component Cores engineers will adopt our if name tory, create-special Course Streets to reset your own individual manufacturing problems!











trakter clamsing THE SPOOL COTTON COMPART . 745 Febr Arrens, New York, N. Y. (Crosse Factorer Division) AVIATION, Apr., 30 PLATION, Apr., 1948.

ere 5 ways bette



No more or effect is wanted in opening (or cho-ing) the Kinnear Hence Operand Dear Jon a tauch on the control human and the wants assure agreement more measurer area across, college the OPPEATOR approved goes somethy and across, coding the fireble seed that cursaes up one of the wist, and charating the opposing completely. How said well space can be safetted to within a few suches of the door. SAYES LABOR The Kenneye Monor Operator, Sectoring a The Kennese Moore Operator, featuring a spe-cially designed steeps copper money, exaction out great and broadle bearings in but and the standard uses of exceptantially long life and the ability. Barrore content principe, can be accorded storm. Baseous control switches can be incaded at a convenient points to save addressed store and storage as a storage and sto SAYES MAINTENANCE

CONTROL

SAVES TIME

These and man, other Kinnear advantages add to in onder the Kinnear Meter Observed Door up to make the Kinnear Ments Operand Door a good itsustance. Plan to our your keep con-write the door that hat proved its dependently; in many cases serving commanuals for

Kannar Doon fe openings of any tile and any Kinnene Magulacturing Company Tactores 1400-00 Failch Avenue, Cohastless M. Ohns 1742 Yoseman Avenue, San Francisco 24, California.



MIRROR The relate of thousands of Abul Eghter pleases, now in outset ore our widely appropried buttle tree. ore quiling a perfect image a strong or Informer, bry marrie Liberty Assoult Marries Liberty Aircraft Micross on all Erst martines mirrors, and as per give the prior o clean, well defined

Each lighter place equipped will a Liberty Marcer has a month left to meet the specific requirement that plone. Thus the pilet che All Liberty Mirrors one new will be available to oil ere

BRACKINGIDGE

WRENCHING

For greater

SAFETY in the air "UNRRAKO"

INTERNAL WRENCHING LOCK NUT

For primary connections in about the "IDA BRAKO" Internal Wrenebley Lock Nut is a superb and officially approved safety nat. Two valcanized thre plays (Fig. 1) impried through the body of the out provide the lecting feature. Fig. 2 shows how those place contact fear throads

of the bull, emering an absolutely denoutable. lesting grip. This design also parasits of marketon throad length in the rest. "Unbrake" is heat-treated to a high degree of Reckwell hardesse. It can be

used again and again before the barran falls below the Wright Field minimum. Our 100" Flush-Hend Social Sole (A) and leternal Wrenching Bolt (III) fully meet the extreme degree of precision and perfection demanded by the aircraft industry. They are made to tolerances se microscopically close as to be specificable only by me long and extensive experience in practices work. The internal wrenching feature of these

bulls facilitates compact designs—thereby say. ing waight, space and money.

STANDARD PRESSED STEEL CO.

AVIATION, APR











Our Marines went over-the-too at Iwo Time in the symbol

and hardest, bettle in the Correl bistory. New Ma wear turn!

Your quota in the 7th is needed to help fresh this war, eide-

track refletion, build prosperity. So, captains of industry,

CAPTAINS of INDUSTRY-here's row Check List

- for it successful plant drives * Get year copy of the "Tth Way Lean Core Determine year queta la E Boude - de barbbons of every War Lane.
 - Arrange for plant-wide showings of "Mr. & Distribute "How to Got Thous" - a new the beautite of West Boards. Circulate envelopes for knowing bonds safe.
 - * Display 7th War Lean posters at strategic And—see that a bench-to-bench, efficate

ATLATION, AND IN

plant your fleg on top - like the Marines et Iwo lima! The Treatury Department authoritation until approximation site publication of this manage by

AVIATION

The is an efficient's 5 Treasure paranteement treatured ander the author of Tenants Detections and Win Advantage Confer . 8



Mainte, Bir tans

1710X, Ayril, 1945

treditional quality and dependability that have made MURDOCK a leader

building still better analysment for a war-in peece - MURDOCK RADIO PHONES embedy the same in redie hearing performance for 40 years.

tiers-on every Schiller front-on

at MURDOCK are learning meny vitel things about Radio Phones that

will be of fremendous basefit in

world at massa.

Write for Catalogue Joday

When you specify MURDOCK for

year beadest, you are assured of

repersemitive, belitone clearness

built into a rogged, shock-proof unit. Solidly made throughout with an lesse

perty. Cushianed constart and links.

SUB-CONTRACTS INVITED

Lat as bely you on Sadis Phones

best. Your enigeness bendled with ners, speed, and skill,

ness make listening a pleasure.

WM. J. MURDOCK CO. 160 Carter St., Chelsea 50, Mass-



O.K.











AVIATION, April







earle vm 400



"If ALRO IMPUSTRIES, INC

1710× Arrs. 2045



rent corresion. Angler of Francischem produced specification over drawn for a Grade A. Type I If you have a corresion problem out for uples of INDUWRAP and for description felder he Touch of Death to Steel." You'll be expeinhibitor merel-connection serious. This bills cores tion before it storts by depositing a traveler file on the emposed send span, often counsed by breaks in the protective of file.

Other important features are that INDLANGAR is croped to S.T.R.E.T.C.H. It late puckaged metal breaths. It is soft and plieble, melding apply to

bug odd-shaped criticies anogly -- without ruptur-ing, breestgete INDAWEAP. to writing for samples and Discours,





FLUID METERING

PUMPS

Antophopos Assess

Webbe Pemp Engineer large year largered on problems developed ACCURATE METERING OF SMALL VOLUMES OF WATER LUBRICANTS

ALCOHOL CO. CASE ALCOHOL CASE A



FOR AIRPORT

La contraction of the Articles of

READY

When The Nation Balls Recognout American history when a real self asses, a man or an organization has hen ready to cope with it, Express shiping is an organized service organized

We years ago to meet the demands of

those times. Since then, through peace and

var, Express has promptly adopted every

ut sir, is connected with the war effort. This warrione transportation experience

ed new hardling techniques will aid in

de autor's postwar commercial chionine

statific advance so as to be ready for the "
selection and the supercedition of the supercedition of Express, both by rail



The next inner yee which that are quiting of the sight stam will week in your machanism, remarked the picture shows. This sposing was designed by operate under a specified feed within, notion operate under a specified beat which, notion for the sposing and the state of the state for the sposing and the state of the state for the sposing and the state of the state of the sposing and the state of the state of the leading and the state of the sta

to Orgen







... to build a BOMBER

-

Arrylone recursual quantitations call for a multitude of size and the benching positiones with the first allumination entropy than amples one promote lands quasi levis, enhant manifolds, extended the size of the size of the size of these and described the size of the size of the size of classification pipe, and their handley levis, and of bent, meeting sight delayer date, financing expectation plant includes and modern normalized production maintain laws and the size of the size of the size of the size of the lands and the size of the size of the size of the size of handless and modern normalized production maintain laws and the size of the size of the size of the size of the handless and modern normalized production maintain laws and the size of the

habitus and modern intradiated production national faces
that the second for the force of the products in the offraction force of the force of the

PROPELLER CUFFS

AVIATION, Auch.

PELLER
JEFS
JOINT LANGE
BUT MORE
WAR BOND!
TO ME LANGE
WAR FORD!
TO ME LANGE
WAR FORD!
TO ME LANGE
WAR FORD!

Tion, April, 1945



The names Un-O-Ro, Lin-O-Rod and Lin-O-Rock are descriptive of the color of the Fina. *Un-O papers are made of 80%, may sheek to greater strength-potenting in free to post-model descripting is will assumed or other sheeks region. These papers—based by had PLINO IS DUE ESCRIPTION TRADE MARE FOR DRY DEVILOPED "DT" Recredention Tracks Clath Makes best represent transported existing-path community

B. K. ELLIOTT COMPANY DRAWING MATERIALA SIRVEYING INSTRUMENTS Pitteburgh . Detroit . Cleveland



ARMSTRON

CLAMP

The Most Useful Fastener of All' - BLIND OR VISIBLE

INGINEERS CALL IT

THE DILL LOK-SKRU PASTENCE IS WINEY HUD TOO HUNDREDS OF APPLICATIONS WITHILATION IS A OWN MAN OFFICEN -150 TO 200 PER HOUR -SAVES VITAL THE AND SPEEDS UP PRODUCTION

1 nelli ONF Hole

7 toward LOK-SKRU Drawn with Clark Clark, seven population real, real, territoria mentioned that mosted thickness and hale dismerer.)

3 Plyated securety by drawing sleave spoinst inner side of metol with special power or hand tool.

ttechment fastened by screw locked in mehor mut



STATION, April, 1945



with surprising ease and speed

with this self-contained

RIE No. 65R No wonder the popularity of this threader has spread widely. The speed

fect threads on 1" to 2" pine are rea sons enough. One set of high smeet ates changes threads all 4 sizes - and they get to nine size in 10 second Workholder sets instantly! You'll like other work-naver features of this rue ged steel-and-malleshie die stock - Mass ----

it pays you to try the self-contained at Andily when No 653 at your Street House per meet it to

THE WEST TOOL COMPANY : PLYSIA, ONIO, II, C.



Models range from 350 to 35,000 water, 18th ravies shorts or those show: 900, 300 and 800 craft, single phase: also mental frequencies. D.C. types construction of the 4000 makes. Dead work. age from englishe. Write for case age opper seasons. While her cogn

> radio neplaction . . . Action classics . . communications . . . cable forreg . . . sirport and general belows . . electrical sepair tools . . . arrest economic . . . mary either attelliculous

The Total States St.

made about to them \$70 Date widow makes 100 Laboratto Dt., New York. AVIATION, and

ELECTRICITY

TO MEET AVIATION



Airclass werts, eften so hard to not et

ere made easily accessible with "Gold

Mariel* Telescoping Rolling Work Stands.

THE PATENT SCASSOU MINO CO., INC.

They are rolled on heavy duty costors, 1900 October Dr., GUILLAGO SIL OF and height is adjusted with a general THE ROPER D. C. CONCLEGE ST. M. eleveting mechanism operated by steal ----Princeton, Fa. + Atlanta, Sa. + San. Property for a Street of the c

sables. A rememble mand rall anchors the 4' x 6' eletform, which reises to 6' ffrom 47 and 14' three 8's. Ask for cate. leg giring range of heights. ON THE BOARD

Johnny Gear has taken his place alone with the planners perting the blue prints ready for the ever you will many when Victory has come Check with Distroduct nowon pear production facilities Bielenderf Gear Corp., Syracuse, New York diefendorf *** GFADS

Let us know so that we can keen

copies of Aviation coming promptly Or Circulation Dept., Asiation 330 West 42nd Street, New York 18, M. Y.

DIE PRING



Leading American Foreign Tealer febes in former markets in weeker addressed figer of imper tant American produces of gris tion instruments and congeners for distribution throughout the Orient and Lates Arrence. Mand other other for Lake Aures Premay connections in the established when conditions on rear Sales assencies router and

ance of expects experiment in If you are seeking clean aggreries rengeneration suits or details of your products for both immedistr and postwar sciling If is

recented we will have a septi-

AVIATION BOX 923 NA M POST IT. SAN FRANCISCO 4. CAUFORN AVIATION, April 1865 PRAYION, April 1865



along.

strona..

BRIGHTBOY TUFF TEX -BRIGHTBOY FINE TEXecother, four tenture: to cold finishes on setter motal place of the courses when

for A One-Operation Job In FURRING, FINISHING, POLISHING bibber cashiered Brighthoy abrustive products hide the grind-to-bed gop in close tolerance finsking and polishing—on alclad, dural, algorizant. stinker, rausel, braze, brooze, course, ailver and fories. There are THREE Brighthey trytunes such 'enhance" and precision-controlled by Bright

bey's restlices rubber binder. If you have never seen a Brighthey finish, it will is a production to your. Ask your distributer for highter production literature, prices and catalog he Brighthow field representatives to show you am remple of a Brighthery finish and also to success

production abort-cuts to home finishing. Telles Seberts Eabber Co. Hewart 7, H. A.



The Acapeste Thermorane Delay Salar affords aufaiting protection to vanily important takes on planes, slape, sobsequer and namesous other applications. These select assessed possible decrease to taken when bush volume at recovered on cold place. Measurewith model weathered by weather or pressure, the other provides delars. from 1 to 120 seconds, between the name that circust is about and volume is applied to the about Office temperature recognitive Di March and Compa

scaling in wise are spended by Amperes Callifon in evadable in few proce, offering a water man of work ing temperatures Send for Bullistia No. 155 for valushie technical date and reggered applications. Callbridge Tengeron Convention, 161 Thirrywisth Sour Phine Cor. New Jersey Breach Officer Change Comband





YEARS PROMEERS IN TUNGSTEN MEDILLIBOR

The exciting story of the helicopter VISE-GR -and of the men who made it possible Till book given you the facts on one of the most inscreeding and significant The series of experiences that made is Wright Brothers, Marris, who was chief Test Pilet for Schooler Aircraft during the three more evident years of the bellevener's

take more expect years or the percepter of craft that can take all attained up, sun and herer, fly hashward, go eideway straight up or down, and even turn arrend

on a spot, is the asswer to temperate's

PIONEFRING THE HELICOPTER By C. L. MORBIN With an Introduction by 1000 I. SINCHESE'S 162 paper, 534 or 8, Sincerescol with abstracease, 22.22

SEEK, simely, thought-provoking book will pur you straight THE truck, thought-providing took was put you considered as the whole story of the conscious exaggraphed, conscious resisted believers. Here is the development of the fire duction believes on the world. Here was well want the resistion of the helicopter from that first unwishibly model dubbant "Apor's nightmane" by the skepeles, into a craft so cable and consoliable that it was acapose by the U.S. Acapo, recommisses in all are the everage and contains of a man whom a mane will always be synchymnon with believely. Here bilevely "Mr. Marris is one of the try persons whose ability, produces and heartridge helped make the winds rehieved of this discretion is realist. I deal that there would be un bankersoned or expected with model of the contract of

HISTORY IN THE MAKING to. Morris press the Private state interested in artistics & principal and the Authorities, When it issues from what it is, what its

and man be removed. Company to the Print, what it is, what if it, what if it, what if it, what is the print of the print o appearance, commercial commissions and contactors MAIL THIS ON APPROVAL COUPON

----City and Date whose one or speeds to C. S. said to

BURKLYN Instant Release Hinges · In the net division ... for

WRENCH

TON GRIP

-AT 448

Wor Effort

to the work with hands property. Halds apprehing your

sign. Is actually Hend-Ylor, Charg. Super-Piler, Advance, East-Wrench, Pape Worsel, I mp Worsel, and Togale Press.

steel. Zing plated, 2 since

Sold through tool publish and dealers,

PETERSEN MFG. CO., Bept. V-4, Bellitz, Hebr

You can save dies and work nieves you formerly used because of embedded tools of our base in Duke Metal Disassegrator. Frequently it pays for No seed with electrical conductivity, not even more carbale or case hardened stort, is too much

is Bufu. It operates through the action of a rapidly

busine electrical are, without excess heat or pres-

sus. You disintegrate openings the size and abuse of

The "Head" (sketched below) is chucked solidly in

and seem harbor our other holding dealer and the

to dictrode without horsesty freighed partners

WAFTO METAL DISINTEGRATOR minimum Method for removing Embedded

Teps, Drills, Study, \$275 Complete.

wak pace is champed firstly to sweld movement. Disappropriate raises place only where the electrode and in contact with the ment to be worked on Date Metal Dimensurance is and to seesowe broken type, drills, mit, and pine; and to form openup in hardened steel. Other uses or being developed daily. k is made for 110s, or 220s, co. eds power. Be sure to specify which you use Dufa Ment Disasserator reques no lengthy trasping period. torone our use it. It comes to

to complete, scady to eq to yearly is 12% Magrafactured by Deafan Corporation, Cochranton, Penn's. processives in her ciries. Next wise or phone for bulleting byencentres in key cities

STATION, April, 2940

ACCRESS INQUIRIES TO DEPT. A WAITER I. GREENIEAE CO. Medicard Distributors, Philippurph, 21, Penn's

LECTROFICH ELECTROLYTIC STENCE FECHING PROCESS The Lectrostrh Florenheir Seach Hard is one of the most popular parts working units on the market doe to be seemed

Your Parts Marking

MADE EASY, FAST,

Economical and Legible

in mertion to matter of seconds) the sheelencly legibility, and the case in There are two kinds of stendis used. the emboard, which can be made on a typewriter and is used for short rons, and the heavy-duty, long-life, engraved plastic stendle, which will clearly mark tens of thousands of parts. Banch Model is ideal for marking flat. cylindrical and odd-shaped parts, can be operated manually, or externatically, and will not interfere with surface toler-

which it can be bandled

secos. No preds used, no heat, shock, or strain, incomensive plastic legation for ture acts as a register mode, asserted consistent, uniform register of all mark-ings. Send for more detailed enformation

How to pass the CAA exams on airplane and engine mechanics over 3.000 questions-and enswers -every phase of practice end theory Street up an adoption multitumers and result-position with these more than falls sense quantion, comprehensively recovery the pre-tical and theoretical investiging required in-propriate mechanics and adoption required in-propriate mechanics and adoption required.

of industry is using them for replacement atter power weekening, many many days. After committee an page

FOR THE

Their Doom is Social Mary character.

AND EYE INJURIES IN 1943 25,700,000 man days were less in imbastry due mbeed and eye injuries alone. Stop this waste of marrower and money with record refere reserves. Look to Selectron successions for merior produces highs wright, comfortable marrie a propher will not remove Our No. Statestate shield shown below gives protection

torbead and chin as well as to the face. Will at interfere with wearing of prescription ne. From your job. or or write direct.

HAVE YOU

MOVED?

yea've moved recently or one planning or

on will common to be delivered to

damps, let us know now no their coules of

res mempily. Use this coupen or a paray

Name abstract the address of my Arteston pulsarintees



4310





A NAME TO REMEMBER

LINEAR

"Par"

Packings



treely coefine the

of the con the

merchan consider

This thoroughly deposedable seal, from zero to peak trees sure, is offerred by the precision design, expelling prospertion

methods and meticulous respection of Linear "For" packings Manufactured from six compositions, each for a specific service. These pockines are selected by designers of a wide variety of the most readers by fronte equipment Service puckings sent upon request. Enterenting and selection, resources of our testing loboratories and fortilities for the complete design of the hydroxic unit itself are great able. Keep linear in mind . . . It's a good name to remember

TATOME PRILATERPHIA AS PRIME

Just Published! Questions and Answers for MECHANICS

ne rigging and alternoon, hedgesten and

made though propriety and ofth

MACRICA, THE CASET 20003 SCHOOL OF ASSOCIATION 552 names. 4% or Priv. 22 Observances, 54.60 LINE or direct note of practical incominage bound on the conference of the Civil Assessation Administrators experience-experience compiled over a partial of 12 years of union and accounting both students and individuals to take U. S. Garrenment term for certification an alcolous and make analysis. The best one to send be the sender to check his brombelow as he arobin the subjects for our or off of the

12 personness formance, and is a ready source of non manerial for modern, working mechanics, opposition mechanics and others. Covers such assential topics oshow to my the wage of a full namiferon type sirylane eligates.

What is the bready account of account; springs containing to your containing the your containing to your containing

people method of courses a threat tearing function of the high-country cartes forms a mark solis Chesif and be used for tearing more proper at masses the writing point, or eclapse, of a generator take the first promote to a membackedir driven bust spream

Or set the the second secon monastically returns had to compensate for self-main or equitations in the hundress of the material being differ. On Gover-Palma Annby providing the manner processes of the tool, the Delling that pounds such power lead much make to prove tend much make to prove tend and to prove protects and of the provent periods of all della. edgest for della up to th'. Especi

DRILL BREAKAGE

TO REDUCE

Use a Brillian Hait That

Antomotically Contrals

Food Rate!

Because of its countrepolited feature which

COVER WEI SON CO.

MAIL TO: McGrow-Hill Publishing Co. natic DRILLING UNIT

230 West 42nd Street New York 18 New York

New Side or produces.

AVIATION, April 18 VATION, April 1840



BETTER LAWNS THE BELT SEED COMPANY OF BALTIMORE



CTER-STRONGER MORE ACCURATE even structure steel is 25 to SIGN lighter then solid frame ret highly shock resistant. Triple plated—copper, nickel and chrome More semilire feel. easier to use Low thermal





Engine Mounts, Hose, Radio Shielding Tolking, Connections for Pushered Cover Scale, As to take Connections, Engine Bulle Seals, Mutual Bubber Ports and many other MARHATTAN Subber Personant many many and account

cohol and low temperatures. enduction with atternal engineers. Wrote for taken



steel for those fig sections: unleading seri many from healthy years bridging street soubles and spore parts as ours pe mercing and reservoying production see ment, new metariols, six, for building or

Write for Outring #58

PRECISION



makin and precision. Teday, control motors such as to arrand on the Salutina planes of the United Nations. factoring, they will had the beneden the sky ways of peace.





FOR AIRCRAFT ENGINES GASKET CRAFTSMEN FOR 39 YEARS

Write for information

THE SUPPLEMENT MANUSCAPTURENCE PROPERTY TORRINGTON, CONN. MANCHES CHICAGO AND LOS ANGELES CANADIAN REZIGERALD, LTD. TORONTO





UNITED NATIONS' FLYERS are using it for SAFER LANDINGS A one-hand turn and a tap on the single frontal

disk instantly valence the humous laws ing the fluor entirely free. Accidental release is impossible before disk is "set" for action-All United Nations' Air Forces for years have used IRVIN as standard equipment . . . and now the Irvin "Single-Release" barness is acknowledged as superior for all landings. IRVIN, as always, leads to Safety.



Main Officer 1670 Jefferson Ave., Mullale S. N. V. Sweden . . . All Serong the United National Air Forces. W

what's going to happen in Aviation?

Will we go back to the handful of military planes we had in 1940?

Can we conduct concernor's air commerce with less than 500 transport planes.

operating an and from the U.S.?

The average speed of our fastest trains is 50 miles-per-boar, of our fastest comaliners just over 30. The average speed of our neuron abelianes is over 250 sept, and socially loceosing. Will U.S. industry and the American positiv pass up-

that out?

Shall we expect the driving force and flying anthonium of three million, keen, arabitions and programby young military alumen to evaporate without effect on perceiting noticing original.

There was a day when we conside a coll automaticle because we didn't have the good reads, and there was no piete to beliding roads because we hardn't the automatics. If that hardn had stopped us, a few-billion dollar industry would sever have been developed. Shall us believe that swinter progress will be "stelemented" because anythous new cost to access—or because they're no big to park in our gausque—or he-

What do you think?

America junes a grampitales. The only strabulent his is have set if it is a Commercial position.

The complex of the least contribution of the commercial position of the commercial position.

The complex of the least contribution of the commercial position of the complex of the commercial position of the complex of the commercial position of t

MACRAGEMENT DUBLISHING COMPANY INC.

339 West 42nd Street





Or More Jool Hours
UTICA Pliese and Adjustable Weeschas
me made to do trough jobs easily and
good mechanic intoo they rand up airdor larg, hard sugge, field only through
an distribution who are amored now a
shown of our full support. . . . final for
Arteriton Balletin No. 41.

UTICA DROP FORGE & TOOL

ARNO TUBE SEAL No. 700



A mm, quicker, more retirible method for miles gill time of unbing. Made to single med to state the method persons with filter disc and special widy subseries. Easy and quick to apply, to be removed in an instant, no raddon. Prick for complex and price little of from the Stade and Industrial Experience of the Made and Industrial Experience of the Made and Complex of the Made and Complex



KESTER CORED SOLDERS

The selfer-inness dan't show what the plants of Pre-American shade silt, yet all bodd. Her they get the screplets over he hepperies and mediateness that is a saust low every part of the great ships.

• Keeper Cured Selfers are manufactured with comparable and the selfers of the selfers are supported by the selfsatisfactured by form season bodd under the most arraw experience confliction, applied withouts, should, heading and extraction.

a Kerter Repin-Giner Index for electrical weeks personterminal resistance, and elimination for hazard hazards in posterior, ylastro revell the will not came decreasing on the contract of the contract of the contract of the other remains right and clear under all appreciage conditions. I work as sever where generate week hazardary research both Kenter Gered Soldien. Both seem your mercels and stope any not allow on the contract of the conmittee of the contract of the contract of the conmittee of the contract of the contract of the same and stope any not allow and the contract of the same and

RESTER SOLDER COMPANY
4866 Wrightwood Avenue, Chicago 39, In.
Language Plant Heady, P. J.
Language Plant Heady, P.



PLETICON, Agril, 1842



AND RUCKING BAR

This rivet removes will extract faulty rivets without derrage. Re-drilling and re-diverling not recovery. New rivet can be invested in some bole. Removal of domeged or faulty rivet does not also Removing rivets with this new Topflight Tool saves time and labor. Priced at \$12,00 it saves its and is new day's use.

TOPFLIGHT





NIAGARA

The CHREDGODTOGGG Coulons of Rombers-is a dismatte assemble

of America's shifty to out-desion, out-produce, end out-fight the every. Vitel parts of the B-29 are being made better and faster with Nisgara Presses and Shears The complete range of sizes and capacities provides the most productive and accompled machines for sheering, blanking and form ing operations. Write for Sulletins.

U. S. War Bonds

NIAGADA MACHINE & TOOL WORKS BUREALO II MEW YOUR -Claveland, Detroit, New York MIGHTY but Gentle!

A ROW

-WILL NOT

MAR CUY OR PAMAGE DELL

CATE SUBSACES

- FLEXUS -IT HEALS

NO STING AND NO PEPOUNDI WILL

NOT CHIP OF CURI





services exceeded to edicion and recommand production and open tion in the evision industry Mile

AVIATION



feature

analysis

recision

hores-



Actually ANALYZES the hole, with results

to frontions of .0001" COMTORPLUG

Specialists in

JACOFL This

> WHERE TO BUY Section experiences when advantages this laws with their address

a habit of checking this page, and DEPARTMENTAL STAFF

AVIATION, APR







EASY ON MEN!

Hand driving screws into garnish molding is slow, has work. But as long as he used slotted screws, this worldfamous manufacturer of automobile bodies didn't dare risk



EASY ON ENGINEERING! Easy on assemblymen . . . easy on the pocketbook . . . Phillips Screws are kind to Design staffs, too. With

power driving. Driver skids came too high - and too often!

EASY ON THE POCKETBOOK!

A change to Phillips Recessed Head Screws ruled one driver skids . . . permitted use of power methods. Alm eliminated one operation involving countersunk washen.
All of which added up to substantial cost-savings!



EASY ON THE EYES!

Besides being strength-builders, Phillips Screws are a great little sales-builders. They help dress up any prod ... do away with unsightly burns that snag clothing a make an otherwise sweet piece of merchandise look so

Phillips, engineers can build product strength and rigidity up to specifications slotted screws just can't approach! It's Phillips the engineered recess

In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-drive efficiency.

... It's the exact pitch of the angles that eliminates driver skids. ... It's the engineered design of the 16 planes that makes it easy to app

full turning power - without reaming. ... It's the "just-right" depth of recess that enables Phillips Screw Hes

to take heaviest driving pressures. With such precise engineering, is it any wonder that Phillips Screen speed driving as much as 50% - cut costs correspondingly?

To give workers a chance to do their best, give them faster, driving Phillips Recessed Head Screws. Plan Phillips Screws into y product now.

de in all sizes, types and head styles

WOOD SCREWS . MACHINE SCREWS . SELF-TAPPING SCREWS . STOVE !

AVIATION, April,